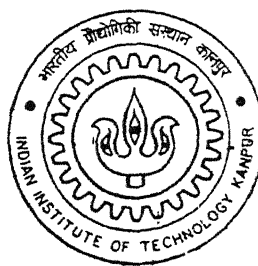


# ONLINE MUSIC STORE: AN E-COMMERCE SIMULATION GAME

By

**Manish Jain**

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DEPARTMENT OF INDUSTRIAL AND MANAGEMENT ENGINEERING

**Indian Institute of Technology Kanpur**

FEBRUARY, 2002

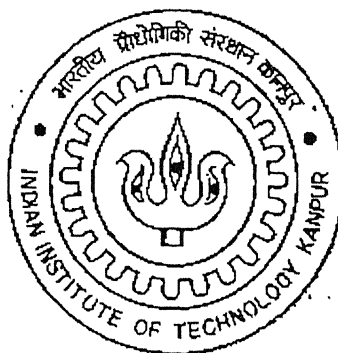
# **ONLINE MUSIC STORE: AN E-COMMERCE SIMULATION GAME**

A Thesis Submitted  
in Partial Fulfillment of the requirements  
for the Degree of ,

**MASTER OF TECHNOLOGY**

By

**Manish Jain**



To

DEPARTMENT OF INDUSTRIAL AND MANAGEMENT ENGINEERING

**INDIAN INSTITUTE OF TECHNOLOGY, KANPUR**

**February, 2002**

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## CERTIFICATE

This is to certify that the work contained in the thesis entitled “ONLINE MUSIC STORE: AN E-COMMERCE SIMULATION GAME”, has been carried out by **Mr. Manish Jain (Roll No. Y011408)** under my supervision and that his work has not been submitted elsewhere for a degree.

20<sup>th</sup> February, 2002



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\* Chapter 1,2,3,5 and 6 of this thesis are joint work of Manish Jain (Y011408), Shailendra Deshmukh (Y011413) and Vipul Shah (Y011415) and form part of the thesis of all three students. Contributions of each one of these may be considered as equal for these chapters.



(Main author of  
Manish Jain)





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***Manish Jain***

# Abstract

Internet is radically transforming the way individuals go about conducting their business with each other. Most corporate executives are convinced by now that the scale and pervasiveness of today's technological change require a fundamental review of business strategy. Web based technologies- through the internet, intranets and extranets- offers universal connectivity at astonishing low cost, with a simple, standardized user interface.

In the 21<sup>st</sup> century, internet has become the most discussed topic and in the media more generally. The speed of development of electronics marketing has been extremely fast by any standards, and specially compared with the slow process of academic research and publication in marketing and other social sciences. The speed of development and the shortage of established theory to support hypothesis testing mean that we should focus more on applied research and simulation tools and less on theory.

Simulation games have been used in management education for forty years. During this time there has been a steady growth in the number of available games and in the number of instructors using them but none exists in the area of e-commerce.

The objective of this work was to bridge this gap and to develop a simulation game for e-commerce environment. OLMS (Online Music Store) is a game specifically designed for the retailing of music products online. It will enable the students and the managers to understand the role that the technology is playing in creating opportunities to rethink business models, processes and relationships along the whole length of the supply chain in pursuit of unprecedented levels of productivity, improved customer propositions and new streams of business.

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# Chapter 1: Introduction

Hoffman (2000) [26] described the Internet as “*the most important innovation since the development of the printing press*”, with the potential to “*radically transform not just the way individuals go about conducting their business with each other, but also the very essence of what it means to be a human being in society*”.

In the 21<sup>st</sup> century, internet has become the most discussed topic in the media. The speed of development of electronic marketing has been extremely fast by any standards, and specially compared with the slow process of academic research and publication in marketing and other social sciences.

However, the extent to which digital media such as internet will revolutionize business, home life, and relationship between marketer and consumer is still controversial. What is clear is that the internet combines many of the features of existing media with new capabilities of interactivity and addressability, as well as making it much easier for both companies and individuals to achieve a global reach with their ideas and products.

The speed of development and the shortage of established theory to support hypothesis testing mean that we should focus more on applied research and simulation tools and less on theory.

## 1.1 Introduction to Simulation Games

Simulation games have been used in management education for forty years. During this time there has been a steady growth in the number of available games and in the number of instructors using them. At the same time, a large body of literature has been published addressing the issues of the effectiveness of simulation games, the conduct of the games, and the design of the games.

Simulation games are activities designed to mimic the reality of the external world, within the classroom, with the goal of instruction. The learning is intended to be experiential - the student experiences the studied phenomenon and learning proceeds inductively. While other methods also aim to provide an experience with reality, the unique characteristic of simulation games is the incorporation of the time element -

simulations imitate the passage of time and the students have to live with the results of their past decisions. Another characteristic of simulation games is their strong sense of make-believe, the sense of playing a game.

Through Participation in a business management simulation, students deal with economic issues and experience the decisions facing business in today's market. Students have the opportunity to gain experience in areas that promote self-sufficiency: entrepreneurship, and life skills.

Student Benefits include:

1. Education about business and economics.
2. Increased self-confidence.
3. The development of decision making skills.
4. Learning about effective team work.

Besides simulation games, there are other means of providing the experience of reality to students - case study, role-playing, in-basket method, and incident process. The main advantage of simulation games over these alternates is the dynamic nature of the games. Having taken a decision in a game, the effect of these decisions persists into the future in the game. Another advantage is the verisimilitude offered - some games are able to provide a high level of make-believe and fantasizing. The strong interest that is aroused in the subject matter is itself of pedagogical value.

## **1.2 Electronic Business: An overview**

Put simply, Electronic Business is doing business electronically. That is, the use of one or more technologies to communicate or trade with trading partners such as customers or suppliers, or to gather information electronically about markets, competitors and business opportunities.

### **1.2.1 Why use Electronic Business?**

The essential relationships for a business are usually within the supply chain, involving suppliers, manufacturers/vendors and customers in a complex partnership. Electronic Commerce can assist all partnerships to be more efficient and more profitable.

Small to medium businesses also depend on a range of services, products and professionals to enable them to go about their business: banks, accountants, lawyers, insurers, telecommunications suppliers and utilities.

The fundamental benefit of Electronic Commerce is enhanced communication, which allows for simplicity, flexibility and new ways of doing business.

- ***Small Investment:*** *Relatively small investment in a computer, modem and Internet access can enable a small business to begin improving the way it does business. Suddenly, traditional geographic and time limitations are no longer present. In addition to sending and receiving e-mail and gathering information from the World Wide Web, the computer can also be used to track customer details and purchases, automate invoicing, and complete many otherwise time-consuming tasks. If your business already operates a computer, you can connect it to the Internet for as little as a \$300 or Rs. 3000 outlay and \$20 or Rs. 650 per month.*
- ***Better Customer Service:*** *With the most basic use of e-mail a small business has a rapid and reliable way to communicate with suppliers or to receive and respond to customer queries. Product information can be e-mailed, as can quotes. Manufacturers can quickly and easily put potential customers in touch with their retail outlets, or accept orders via e-mail.*
- ***Open for Business:*** *Businesses are no longer tied to business hours or to one location with Electronic Commerce. Operating 24 hours and seven days is possible without the traditional overheads. Orders can be accepted by a website or by e-mail while you sleep. And you can respond while the customer sleeps. Naturally you should apply the same caution to filling orders from the Internet as you would to any other unsolicited order.*
- ***Lower Costs:*** *Orders can be accepted, confirmed, processed, and increasingly, paid for within an electronic environment. A well developed Electronic Commerce system can provide real cost reductions over the traditional telephone, fax or paper-based transactions, speeding up order taking and cash flow, increasing accuracy and reducing rework.*
- ***Reduced Inventory:*** *With shorter, faster supply chains, the need for physical warehousing of inventory can be reduced or removed.*

- **A New Way of Doing Business:** With Internet commerce there is another sales channel operating around the clock. It is increasingly possible to undertake dealings with banks, insurers, super funds, and government departments online. This eliminates the need for paper and post, queuing up or waiting on the telephone. It is not only faster but many of these activities can be done after hours, freeing up business hours to spend on customers.

### 1.2.2 Ecommerce | Online vs. "Traditional" Commerce

Users come to online commerce with some key experiential understandings of the characteristics of *traditional* commerce.

- **Identity:** Customers can easily authenticate the identity of a merchant simply by walking into a bricks-and-mortar store. Stores can be members of a community and neighborhood; they can be part of customers' daily experience. There is concreteness about a physical store that no amount of HTML will ever match.
- **Immediacy:** Customers can touch and feel and hold the merchandise. Tactile cues can drive the decision to buy. A transaction that is face-to-face is usually *unmediated*: your communication with the merchant is not in the hands of a third party or technology (as with ordering by phone).
- **Value:** The item at the center of the commerce transaction - the product, service, or property that is to be sold/bought-has some kind of value. Its price is determined and validated through the performance of the transaction. The seller agrees to a selling price, and the buyer agrees to a buying price. The value of an item, especially the relative value an item has for the buyer, is much easier to appraise if that item is close at hand.
- **Discourse:** Customers can converse with the merchant face-to-face; unmediated conversation is basic to human communication. People want the feedback available from non-verbal behavior, which forms a large part of our judgment process.
- **Community:** Customers can interact with other customers and gain feedback about the merchant from other customers, as well as by observing the merchant interacting with other customers.

- **Privacy:** Customers can make purchases anonymously with cash; they usually don't have to give their name or address. They don't usually have to worry about what a store will do with their personal information, although this is becoming more of an issue with various recent attempts by lawyers to access private sales and rental records. Privacy is often a measure of how much of his or her identity a buyer wants to invest in a transaction; sometimes, we just want to quietly make our purchase and leave with it.

An online commerce customer faces mediation in every element and at every stage of the commerce transaction. Customers can't see the merchant, only the merchant's website; they can't touch the merchandise, they can only see a representation; they can't wander around the store and speak with employees, they can only browse HTML pages, read FAQs, and fire off email to nameless customer service mailboxes; they can't explore the store's shelves and product space, they can only search a digital catalog. A customer at an online commerce site lacks the concrete cues to comfortably assess the trustworthiness of the site, and so must rely on new kinds of cues. The problem for the online customer is that the web is new -- to a large sector of the online audience- and online commerce seems like a step into an unknown experience.

*But current studies (Ernst & Young, 2001 [68]) found consumers continuing to be very satisfied with online retailing. They continue to buy online in increasing numbers and spend more on a greater range of merchandise categories, while being concerned with shipping costs and generally price-sensitive.*

### **1.3 Scope of the Thesis**

This thesis is an attempt to make a contribution in designing a simulation game on online retail business with a view to make future managers learn and understand the vital role that technology is playing in creating the right value proposition to the customers as well as altogether a new way of doing business for the traders. The value proposition is complex- encompassing price, quality, information, selection, service, and entertainment, but understanding how consumers react to technology, and when technology should be used in the shopping process, is critical to success.

### **1.3.1 Objective**

The objective of this work is to develop a learning tool for online retailing. While we already have so many games available in the market that covers virtually each aspect of business intricacies, we still feel that there is a need for developing a new business game?

There are primarily two reasons for developing a new game:

1. There is no business game available for a rapidly emerging area of E-Commerce in Indian context. Significant advances in the Information, Communication and Entertainment (I.C.E.) technologies in the past decade have ushered in a new era of Information Technology (IT)-enabled trade opportunities. Especially for a developing country, such as India, the recent economic trends have identified IT as a growth area in which India can establish a premier global presence. Indeed, one of the NASSCOM (National Association of Software and Service Companies) studies indicates that India can expect to earn at least 8.5 billion US dollars from IT-based exports by the year 2002 (Source: [www.nasscom.org](http://www.nasscom.org)). Some major developments fostering this belief are the rapid growth of software industry and the use of Internet (or World Wide Web) as a medium for conducting international trade. It is clear that a business game specifically catering to the area of E-Commerce in the context of India would be an immensely useful aid to future managers.
2. While there exists so many business games but not many exist that integrates all the areas of business such as Marketing, Operation's Management, Supply Chain, Retailing, finance etc in e-Business context. Therefore developing this game is an attempt to provide a common platform to impart learning in all the areas of business.

### **1.3.2 Relevance**

This game is specifically been designed for use:

- In the later part of a basic operation's management course.
- In the later part of a basic marketing course.
- In a course or executive training program on online retailing.



In any of these courses, this game can be used in conjunction with lectures, readings and cases, or by itself. It can be administered over several weeks in a semester course, or concentrated over three full days in a short executive program. It can be given as an assignment outside the classroom, or group sessions may be planned during the regular teaching hours when the instructor is available for interaction with the participants.

### **1.3.3 Structure of the Thesis**

This chapter gives a brief introduction about the simulation games, the advantages of e-commerce on traditional business and a brief overview of the thesis. Chapter-2 reviews the research that has been done in related areas, i.e. simulation games, online retailing, supply chain management, demand models etc. In chapter 3, the framework and development of the simulation game is explained in details, the program is developed in JAVA, a platform independent Object Oriented Language. An attempt has been done to explain all the processes in the simulation clearly, for this purpose flow charts are drawn and explained for all the processes in this chapter. Chapter-4A deals with the development and implementation of the demand model that is used in the game. Chapter-4B deals with the implementation of the Repeat purchase model and product probability model. Chapter-4C deals with the Supply chain and Inventory module. Chapter- 5 contains instructor's manual to the game. It describes in details all the screens, decision variables and performance measuring indexes used in the game. This chapter is for the reference purpose of instructor and the students for helping them in understanding the games. The last chapter gives the conclusion. This chapter also discusses the limitations of the game and scope for further work.

## Chapter 2: Literature Review

### 2.1 Research in Simulation Games

Simulation games have been used in management education for forty years. During this time there has been a steady growth in the number of available games and in the number of instructors using them. At the same time, a large body of literature has been published addressing the issues of the effectiveness of simulation games, the conduct of the games, and the design of the games.

Simulation games have been used in diverse areas of instruction - from aircraft simulator to simulation of interpersonal relationship in organizations. There is a wide range in the complexity of simulation games: from board games to computerized simulations. Even the simple act of walking may serve as a simulation for instructional purpose (Wu, 1988)! While a simulation mimics reality and is often used to predict what would happen in a given scenario, the word "game" suggests playfulness and competition. Simulation games combine these two characteristics. Games that explore business strategies for the entire organization are called top management games, and games that have their primary focus on a selected functional area of business are called functional games. These functional games are available in the areas of accounting/finance, marketing, production, and human resource management.

The first simulation game for teaching business management appears to have been introduced in 1955. This game, called *Monopologs*, was developed by the Rand Corporation for teaching logistics to U.S. Air Force personnel (Faria, 1990) [19]. In 1956, the American Management Association introduced its *Top Management Business Game*, which was meant for training top management, and included decisions on production, marketing, assets, inventory, etc. The computations were performed on an IBM 650 computer (Kibbee *et al.* 1961) [32]. In this game, the players filled a form indicating their decisions, this information was punched into cards, and the computer program was run. The computer provided performance reports, and the cycle was repeated. By 1961, Kibbee *et al.* (1961) [32] listed 31 computerized business games, five of which were production simulators. Since then there has been a steady increase in the number, sophistication, and adoption of simulation games (Faria, 1987[18]; Burgess, 1991 [10]). The wide availability and use of business simulation games raises a number of questions *Are games valid as educational tools? How effective and efficient are simulations*

*for educational purposes? What games are available, and what are their objectives? How to design these games? How to mount a simulation gaming module in a course? How widespread is the use of simulation games for instruction?* Over the last forty years large number of articles and books have been written to answer these and related questions.

### 2.1.1 The pedagogy of simulation games

How valid are simulation games as educational tools? Games are often simply so much fun that students do not mind spending long hours on them. But do they learn anything? Could another teaching tool be used with more effect or with fewer resources? There exists a vast amount of literature which attempts to answer these questions. Greenlaw and Wyman (1973) [23] reviewed the literature on the educational value of simulation games. Wolfe (1975) [80] brought this review up to date to 1983. Keys and Wolfe (1990) [31] have also provided a comprehensive review. These reviewers have lamented on the inconclusiveness of all this research. This section summarizes some of this research.

The theoretical underpinning of simulation games as a learning/teaching tool is provided by the model of experiential learning. Kolb's (1984) [33] experiential learning model is shown in Figure 2.1 According to this model concrete experience of a phenomenon in the real world triggers the learning cycle. This event is observed, and causes reflection in the student. The student forms abstract concepts and hypotheses to experiment with reality. These concepts are tested in new situations that provide concrete experience, which starts the cycle again. Simulation games provide the concrete experience needed in Kolb's model.

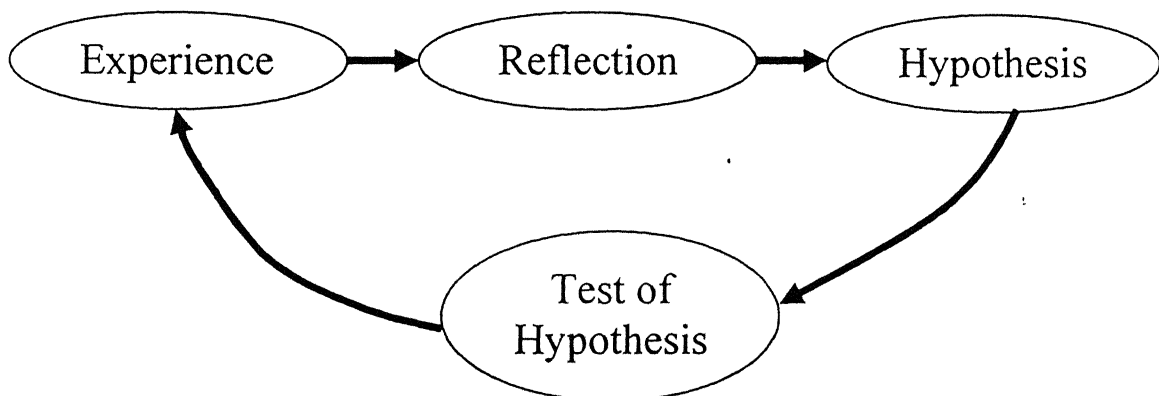


Figure: 2.1 Experimental Learning Model

Besides simulation games, there are other means of providing the experience of reality to students - case study, role-playing, in-basket method, and incident process. The main advantage of simulation games over these alternates is the dynamic nature of the games. Having taken a decision in a game, the effect of these decisions persists into the future in the game. Another advantage is the verisimilitude offered - some games are able to provide a high level of make-believe and fantasizing. The strong interest that is aroused in the subject matter is itself of pedagogical value.

Raia (1966) [55] in his often-cited study carried out an experimental comparison between a simple game, a complex game, and readings. He compared students who did only cases against students who did cases and games. Attempts were made to equalise the workload. They did not find the interest of game players any higher than non-game players. Their attitudes towards cases, management, course, and the instructors were not significantly different. Same results were obtained for perceived or actual learning.

Wolfe and Guth (1975) [80] made an experimental comparison between case-only and game-only approaches of teaching business policy. In their study, the game-only students achieved a higher level of examination scores than the case-only students. Students in the game-only section achieved a higher degree of principle and concept mastery, but the differences in fact mastery was not significant. However, their games-only section had a lot of structure - periodic reporting, class discussions of events, review sessions, self-appraisals, and diary of events. This structure and guidance essentially closed the loop of experiential learning (Figure 2.1) and may have contributed to the positive result as evidenced by a subsequent (Wolfe, 1975) [80] study which did not have this guidance, and had a negative result

DeNike (1976) [13] carried out an exploratory study attempting to explain the conflicting findings about the effect of simulation games on student motivation, factual learning, and attitude. He found that, like other instructional strategies, simulation gaming may be suited for students with some particular cognitive style: (1) gathering a great deal of information from listening to others, (2) deriving meaning from sounds other than words or numbers, (3) empathizing, (4) preferring peer-group interaction, (5) Able to operate in independent study settings, but preferring not to do so, and (6) reasoning through the application of rules and/or definitions.

Remus (1977) [58] explored student attitudes after the conclusion of a business management course that included a simulation game. Like some earlier studies, he found that students' enjoyment of the game, their perception of acquired knowledge, their perception of the generalizability of the game, and their taking responsibility for the game results are all a linear function of the ranking of their performance in the game. It appears that only the winners of simulation games are positive about gaming. Since simulation games are often competitive, and there are invariably much more losers than winners in a competition, it appears that students' self-reported benefits will be negatively biased. This study points to the need of underplaying the competitive element in gaming. In a follow-up study, Remus et al. (1977) [58] confirmed the earlier findings. They found that the rank to satisfaction relationship was weaker for multi-person teams as compared to single-person teams. They also found that, for the multi-person teams, high rank was associated with conservative, consistent, and systematic decisions. They (Remus et al., 1977 [58]) also found that students come to a gaming class with rather high degree of educational expectation, and are somewhat disappointed with the experience; but they still recommended continuing the game in the course.

Parsuraman (1981) [52] classifies the existing evaluation of simulation games into three methodologies - (1) Experimental evaluation, where the students are split into different groups which are exposed to different educational techniques. The efficacy of the techniques is then judged by a common examination at the end. Most of this type of evaluation has been inconclusive, and Parsuraman criticized this kind of evaluation on the basis that the common examinations test cognitive learning of the students, while simulation games actually teach the "process" of decision-making (and not cognitive learning). (2) Correlation between students' performance in the simulation games and their performance in other examinations and assignments in the course. Here, Parsuraman questions the simulation game performance as a measure of learning. (3) Surveys of student self-report. Generally these surveys have shown simulation games on a positive light, but the ability of the students to judge the worth of games is questionable. Parsuraman concludes that the evaluations should actually test the appearance of reality in the games, and the worth of the types of decisions made in the games. He suggests that experienced practitioners, not college students, are better judges.

Ruohomäki (1995) [63] discusses the use of simulation games from the viewpoint of learning theory. A simulation game combines the features of games (competition, cooperation, rules

participants, roles) and simulation (abstraction of reality by a model). Simulation games are used when there are not possibilities for students to get experience of the systems or situations in the real life - where reality is too expensive, complex, dangerous, fast, or slow. Ruohomäki identifies two purposes of simulation games: 1) understanding of reality - to describe, analyze, and evaluate realities, and 2) training - learn procedures, and carry them to work activities. To achieve these, a simulation game should include orientation to the game prior to the game, the game, a debriefing consisting of reflections and observations, and forming concepts and generalizations, and integration. Simulation games can provide an opportunity for the active experimentation phase of the experiential learning cycle. Participants can try out new solutions, and see the probable consequences. According to Ruohomäki, simulation games provide: 1) cognitive learning outcomes - information, principles, critical thinking, 2) attitude changes toward the subject matter, society, and oneself, 3) increased motivation and interest towards the subject, for doing research in that field, and 4) positive effects on groups - better communication, interactional skills, empathy for those in other roles. Simulation games provide active learning (vs. passive learning in lectures), so it is a student-centered method. It emphasizes learning by doing.

Lane (1995) [38] in a review of simulation games has crystallized some of the cautions to be exercised in the educational use of the games:

1. Learning objectives. It is easy to be sold by the gimmicks and fun in the games, but what will be learnt?
2. Supporting materials. There should be enough learning materials to support the game's objectives.
3. Other pedagogical tools. It cannot be expected that simulation games will serve all the needs of a course. At best they will supplement a well-designed course.
4. Bells and whistles. So much seductive technology is available that it is possible for the designers to be looking for appropriate topics for the technology, rather than finding suitable technology for the teaching objectives in hand. The use of animation, multi-media, and virtual reality may provide more fun than education.

5. Complexity. It is better to have a simple game serving a specific learning objective, than a complex game satisfying a number of objectives. Students may find it hard to capture the desired experience.

6. Briefing and debriefing. Evaluation of simulation games has shown time and again the importance of proper briefing and debriefing. Students cannot be left to decide on the rationale of the game, and to reflect on what happened.

7. Facilitators. The facilitators need to understand the simulations and the learning objectives thoroughly. Games cannot teach by themselves.

8. Resources. Computer software is famously known for underestimating the resource requirements. Games designers need to beware.

In a similar vein, Riis, Johansen and Mikkelsen (1995) [59] suggest the following as the keys to success in applying games:

1. Define the pedagogical and learning context for the game.
2. Define the subject area and the objectives of the game
3. Identify the resource limitations such as the limits on time and cost.

In an interesting article, Partridge and Sculi (1982) [53] present the perceptions of game participants on the managerial skills developed by top management games. They used the eight managerial skills identified by Mintzberg (1973) [46] for this purpose. They compared the ranking of these skills, as ranked by senior managers in order of importance, with the ranking by game participants in order of game's contribution to the development of the skills. Interestingly, the ranking were in almost reverse order! Apparently, the games do not help in developing the most important skills - leadership and peer skills. The only important skill for which games were beneficial was "decision making under ambiguity". This study clearly depicts the quantitative bias of games as against the development of people skills. The authors suggest the use of cases in conjunction with the games to bring out the leadership and peer skills.

The latest wrinkle in the games scenario is the bundling of decision support systems (DSS) with the games. DSS provide the game players detailed modeling and decision making capability (Yeo and Nah, 1992) [82]. These can provide what-if scenarios, financial analyses, expert systems, and other decision support. So far, the benefit of DSS's to the students' learning in a games environment has not been demonstrated. Indeed, the benefits can be questioned: DSS may provide some of the answers the students should seek by themselves, and the ultimate DSS model will duplicate the model included in the management game, so everything will be transparent! But where the goal of the games is to encourage the practice of certain tools and techniques, e.g. Material Requirements Planning (MRP) and Linear Programming, a DSS incorporating these tools and techniques may be beneficial.

In conclusion, in spite of many anecdotal success stories and apparent student enthusiasm with games, the objective, experimental evaluation of game-based instruction, particularly as compared with case-based instruction, remains inconclusive. Obviously, it is hard to control for the quality of games as compared to the quality of cases, for the instructional style and structure, and for the enthusiasm on the part of the students and the instructor. Post-game counseling and review appears to make a definite positive impact on the effectiveness of gaming. The literature generally supports the notion that students usually find gaming enjoyable in spite of the considerable time taken up by it, and a well-conducted simulation game is at least not worse than a case study in providing experiential learning. But judicious use of both cases and simulation games in classroom should bring out the benefit of both techniques in the development of managerial skills.

Some 40 years after the inception of management simulation games, the effectiveness of games in teaching / learning management topics is still unclear. Nor is there consensus on the teaching and grading method to be used in conjunction with the games. But it is fair to say, from the numerous studies done, that a well conducted simulation game can provide an excellent experiential learning atmosphere for the student of management.



## 2.2 Research in Online Retailing

Online retailing underwent a major transformation in 2000—especially in the United States—as many pure-play e-tailers went down in defeat, and the investment community turned cautious or indifferent.

At the same time, many traditional retailer and consumer products companies expanded their merchandise assortments online to cater to customers spending more on a wider range of products. Clearly, companies recognized that online retailing is no longer an option but a business requirement.

Ernst & Young's study, 2001[68], "Global Online Retailing," gives a broad overview of current e-tailing trends. It also presents portraits of the online retailing climates in the U.S. and in 11 other countries: Australia, Brazil, Canada, France, Germany, Israel, the Netherlands, South Africa, Spain, Switzerland, and the United Kingdom. Data was gathered in October and November 2000.

Here are some of the more significant findings:

- More people are buying online. Almost two-thirds of our survey participants worldwide have purchased items online in the past 12 months, including 74% of U.S. consumers.
- Consumers are making more online purchases and increasing their spending. Books, CDs, and computer equipment are still the best-sellers, but consumers are beginning to move into such "high-touch" products as apparel and health and beauty products.
- Amazon.com is still the consumers' favorite site world-wide. But several traditional brick-and-mortar retail brands are now top 10 multi-channel brands.
- Store traffic is being affected by e-tailing. More than half of all shoppers said they visit stores less often because of online shopping.
- The demographic profile of the online shopper has begun to resemble a "typical" on-land consumer. Males dominate outside the U.S., but women now represent almost 60% of online shoppers in the U.S. and almost 50% in Canada and Australia.
- The majority of customers expect to find lower prices online, but don't always. More than a third of companies interviewed worldwide have different pricing structures for their online and off-line operations.

- Shipping costs rank as the number-one factor discouraging online buying. But 89% of companies interviewed still charge for delivery, and 11% reported using delivery as a profit center.

**Table 2.1: Importance to companies of online channel for various goals:**

	United States	Australia	Brazil	Canada	France	Germany	Netherlands	U.K.
Marketing	3.5	3.7	3.0	2.0	3.0	4.0	3.3	3.5
Brand Extension	3.7	3.7	2.8	3.3	2.3	3.3	2.3	3.4
Driving Store Traffic	3.1	3.0	2.5	1.7	2.3	3.7	3.0	3.0
Driving Revenues Growth	3.7	3.7	2.8	2.7	2.7	3.0	3.0	3.4

Mean rating on a 4-Point scale, with 4 meaning very important

(Source: Ernst and Young, 2001 [68])

Successful retailers know that the customer is the ultimate judge of the quality of a shopping experience. Everyday, shoppers decide which merchant is doing the best job serving their needs. Consumer enjoy more choice than ever before- in stores, brands, and channels- and have access to an ever-increasing amount of information upon which to base their buying decisions. Capturing the purchasing power of these sophisticated is a difficult and constant challenge for retailers. The value proposition is complex – encompassing price, quality, information, selection, convenience, service, and entertainment –and providing the right balance is not easy task.

Before retailers invest more time and money in developing, deploying, and promoting retail technologies, these questions should be asked:

- What role do consumers want technology to play in the shopping process?
- Are people overwhelmed by the technical innovations and want simpler rather than more sophisticated shopping experience?
- Have companies already tapped out the most promising applications of technology?

From the customer's perspective, there are costs as well as benefits associated with new technologies. They often are confusing, take more time to learn, are prone to failure, and can raise the prices of goods and services.

The Indiana University Centre for Education and Research in Retailing and KPMG did study (2001) [78]: "*Ideal Shopping Experience*" for Retailing, here the some of the important findings of this study.

Online shopping features that consumers must have

<u>Product Information</u>	<u>(%)</u>
Online product price	92.9
Product prices and promotions at the closest retail store	64.3
Products specifications, usage instructions, and warranty information	57.3
Online list of product promotions	50.4
<u>Payment, fulfillment, and customer service</u>	
Toll-free telephone access to customer service	78.6
Products shipped to home or office	77.6
E –mail order confirmation	72.6
Secure, web-credit payment	69.3
E –mail shipping confirmation	66.5
E –mail access to customer service	58.0
Online shipment tracking	55.7
Returned shipped back to retailer	52.4

Shopping features that consumer would prefer not to have

<u>Communication</u>	<u>(%)</u>
Online advertisements for products sold by a Web site	16.7
E –mail notification of new items	13.2
Manufacturers' online product advertisements	10.4
<u>Pricing</u>	
In-store prices that change daily based on stock levels/competition	36.2
Shelf pricing but no item pricing	26.6
Store that sells products at discounts to its most frequent shoppers	12.4

Checkout and payment

In store purchase receipt available on private web site 36.4

In store purchase receipt e-mailed to you 29.4

Pay for online purchase by faxing credit card number to retailer 28.5

Pay for online purchase by swiping credit card through keyboard 19.1

This study says what consumer wants and do not wants for shopping. On basis of this study, one can design Retail shop.

**2.2.1 What Consumers are buying?**

Globally, the so-called commodity products like books, CDs and computer equipment are still the top sellers. However, “high-touch” products like apparel are becoming much more important and there-fore represent a significant selling opportunity. Apparel ranks in the top five in the U.S. and Canada. Other categories, like health and beauty products, sporting goods, flowers, and toys are beginning to show notably increased consumer shopping penetration.

Table 2.2: Top 5 purchase categories:

	United States	Non-U S	Australia	Brazil	Canada	France	Germany	Netherlands	U K.
1	Books	Books	Books	CD's	Computers	Books	Books	Books	CD's
2	Computers	CD's	Computers	Books	Books	Computers	Computers	CD's	Books
3	CD's	Computers	CD's	Computers	CD's	CD's	CD's	Computers	Computers
4	Apparels	Tickets/ Reservation	Tickets/ Reservation	Electronic Products	Tickets/ Reservation	Tickets/ Reservation	Tickets/ Reservation	Tickets/ Reservation	Tickets/ Reservation
5	Tickets/ Reservation	Videos	Apparels	Videos	Videos	Videos	Videos	Electronic Products	Videos

(Source: Ernst and Young, 2001 [68])

**2.2.2 Online Music Retailing**

Unlike everyday grocery needs, Music is not considered a necessity of life. But music freaks often get carried away and their purchase decisions are impulsive.

There are large numbers of online music retailers in the world; some of them have offline presence also (like PlanetM in India). Each online retailer is using different strategy to attract more customers. Table 2.1 shows attributes (what they offering to their customers) of

different online music retailers. These retailers are offering large number of varieties (CDNOW.com has 500000 varieties – 10 times more than largest physical music store). Another important attribute is: Delivery time and payment mode, these two attributes also play important role to convert customers in to buyers.

Table 2.3: Online Music Retailers' attributes

Web site/ Feature	CDNOW	CDUniverse	CD connection	PlanetM	HamaraCD	Rediff
Types Products	CD, Cassette, Vinyl Recording	CD, DVD, Cassette	CD, VHS Tapes, DVD, Cassettes	CD, VCD, Cassette,	CD	CD, Cassette
Music Categories	All types of English song (Rock, Jazz, Pop, Country etc)	All types of English song (Rock, Jazz, Pop, Country etc)	All types of English song (Rock, Jazz, Pop, Country etc)	International Music, Hindi Music (Film, Ghazal, Classical, Oldie, Spiritual), Regional	Hindi (Ghazals, Classical, Pop, Filmy), Regional (Bengali, Malayalam, Telugu, Tamil)	Hindi, Pop, Hindustani, Classical, Ghazal, Ne, Hindi – O, Hind Song, Rock, Pop
Payment Modes	Credit Card, Cheque, Money Order	Credit Card, Cheque, Money Order	Credit Card, Cheque, Money Order	Credit Card, Cheque, Cash on Delivery, Demand Draft, e- Card	Credit Card, Cheque	Credit Card, Cheque, Cash on Delivery, Demand Draft, e- Card
Delivery Time & Cost	3-8 day ( \$ 3), 2-3 day ( \$ 6), 1 day (\$ 10)	3-8 day ( \$ 3), 2-3 day ( \$ 6), 1 day (\$ 12)	3-10 day ( \$ 3 5 per Order)	3days (Rs 5 for Cassette, Rs 10 for CD)	7 days ( No cost)	3-4 day (Depends on distance)
Mode of Shipping	Parcel Service, Air Mail	Parcel Service, Air Mail	UPS, First Class, Priority Mail	Courier	Courier	Courier
Customization	No	No	No	No	Yes	Yes
Order Cancellation	Yes	Yes	Yes	Yes	No	No
Cost	Vary on products	Vary on products	Vary on products	Vary on products	Rs. 375	Vary on products

### 2.2.3 E-COMMERCE SURVEY: INDIA – GROWTH OF E-COMMERCE

Table 2.4: E-commerce Survey

Year	Total E-Commerce Transactions(in Rs.crore)	B2C (in Rs.crore)	B2B (in Rs.crore)
1998-99	131	12	119
1999-00	450	50	400
2000-01	3500	300	3200
2001-02	15000	1800	13200

(Source: Commerce Net: Barriers to Electronic Commerce 2000 Study).

### 2.2.4 Barriers to E-commerce

Global Top Ten Barriers, 2000: Business-to-Consumer eCommerce Perspective

1. Security and Encryption.
2. Trust and Risk.
3. User Authentication and lack of public key infrastructure.
4. Internet/Web is too slow and not dependable.
5. Lack of qualified personnel.
6. Customers can't find me.
7. Ability to make and receive payments.
8. Legal issues.
9. Culture.
10. Cost justification.

Several top concerns are shared between U.S. and non-U.S. companies in the Business-to-Consumer space. Both groups consider security concerns (including issues of trust and risk and user authentication) to be the biggest barriers. Other shared concerns include difficulties in customers finding them, culture, and lack of qualified personnel. Interestingly, slow speeds and unreliability of the Web is a major concern outside the U.S. but not in the US. This may reflect the smaller penetration among non-U.S. households of high-speed Internet connectivity.

(Source: Commerce Net: Barriers to Electronic Commerce 2000 Study).

### **2.2.5 Retail Music Industry in India**

For a country that produces over 800 films a year, with music being one of the most important ingredients of any film, it is probably not surprising that 'filmi' music rules as the dominant music category in India, accounting for between 48 and 70 per cent of a music market conservatively estimated at Rs. 1,200 crore. And that is just the legitimate music business. The sales of pirated music accounts for another Rs. 800 crore, taking the total market size up to around Rs. 2,000 crore.

Total cassette sales in India are estimated at 340 million units, growing at 10 per cent, while CD sales account for 14 million units, growing at 15 per cent. These figures suggest India is the largest cassette market in the world. Arthur Anderson projects a doubling of the market over the next 5-8 years. But that will be a long climb and a hard struggle as players' battle for market share.

Repertoire-wise, according to retail sales manager North, Saregama India, Vikas Chaturvedi, the breakup goes like this: New Hindi Film 55-60 per cent, Old Hindi Film 12-13 per cent, Bais/Pop 2 per cent, Classical 0.5 per cent, International 2-3 per cent and Regional Music 22-23 per cent. (Source: The Economic Times - 21/08/2001)

There are many branded and unbranded music products available in Indian market. All of these companies sell their products through retailers. Some of companies have their exclusive retail outlets in few cities but they also sell through retailers. Retailing of music products is a big challenge for any music production company.

The growth of organized music retail chains like Planet M and Music World are also contributed to growing the market, as are Music Television channels. These both store have online presence also namely [www.PlanetM.co.in](http://www.PlanetM.co.in) and [www.musicworld4u.com](http://www.musicworld4u.com) respectively. Many portals which have no physical store, are also selling music products (like Rediff.com, Yahoo.com, Fabmart.com, FirstandSecond.com, Hotmail.com, music-today.com etc). Retail Music industry is facing stiff competition. Retailers are using different Marketing and Supply Chain strategies to grab market share. Some may have physical ware houses, while some may not have any ware house (No inventory strategy and thus no holding cost). Some are using

extensive price promotion strategy, while some may not use price promotion but they may have very fast delivery policy. We can see that there are many different strategies use by these Retail companies to maximize their respective objectives.

In this highly competitive era, Supply Chain management and Marketing are two most critical issues for any online retail music shop. Retailers, which can handle these two issues very well they are at better off.

## **2.3 Research on Supply Chain**

A supply chain, from an operations perspective, has three components: sourcing or procurement, manufacturing and distribution, and inventory disposal. In each component, the internet is significantly affecting how supply chains are being managed, leading to new challenges while ultimately promising to provide value. The likely future is collaborative supply chain management that promises to make, for the first time, the dream of virtual integration a reality.

Traditionally supply chains were viewed as linear systems, with raw materials entering at one end and finished goods reaching the consumer at the other. Each of channel members would act as a closed, independent entity, with little or no direct information from others.

Companies used to maintain large inventories and excess capacity to insulate themselves from variability and volatility. In addition to standard inventory carrying costs, inventory is a major risk in today's fast-paced market, because today's consumers' wants change rapidly. Now companies increasingly move toward outsourcing, contract manufacturing, and third party logistics as short product life cycles and tight profit margins demand minimal inventories (Sridhar et. al., 1992) [54].

The widespread adoption of Internet has resulted in the possibility of disinter-mediation of information flow and physical goods flow: a company selling a product no longer has to own/deliver it to customer. As a result, supply chain structures arise in which the retailer is primarily concerned with customer acquisition, and the wholesaler takes care of inventory and fulfillment. This form of doing business on the Internet is identical to the practice of drop shipping that some catalog companies employ. A recent survey indicates that more than 30% of online-only retailers use drop shipping as a primary way to fulfill orders. Since marketing



and operations functions under such arrangement are performed by separate companies, new inefficiencies arise that result in suboptimal system performance.

Now drop-shipping should be studied in detail. Drop shipping is defined in marketing literature as "... a marketing function where physical possession of goods sold bypasses a middleman, while title flows through all those concerned. The function of drop shipping involves both the middleman who initiates the drop ship order and the stocking entity that provides drop shipping services by filling the order for the middleman" (Scheel ). Drop shipping is different from many of the supply chain structures previously described in the literature in which the wholesaler is involved in the retailer's inventory management. It differs from the traditional consignment agreements in which the retailer holds (but does not own) inventory and decides what the stocking policy should be (under drop shipping the stocking policy is entirely controlled by the wholesaler. Drop shipping is close to but different from Vendor Managed Inventory (VMI), since the retailer does not deal with inventories and hence does not incur any inventory-related costs. At the same time, the wholesaler does not have direct access to the retailer's store where she could rent space and organize it in such a way that influences demand according to the wholesaler's preferences (as is often the case under VMI). Drop shipping also differs from outsourcing of inventory management, since under outsourcing the retailer usually still influences stocking quantities for each product.

Prior to the invention of the Internet, the practice of drop shipping was mainly restricted to two different settings. For large transactions of industrial goods, the wholesaler might have the manufacturer make the shipment directly to the retailer (and in some cases directly to the end customer). This is typically beneficial for shipments that in themselves achieve sufficient economies of scale, making the wholesaler act primarily as a market-maker. The second use of drop shipping, which is more relevant to our setting, is when a catalog company has the wholesaler drop-ship the product directly to the end customer. This practice, however, has had very limited success, mainly due to problems in the integration and timeliness of information between the business partners, as well as high transaction costs. As a result, even the catalog companies using drop shipping only use it for bulky and high cost items. Hence the potential for drop shipping has been deemed limited by many marketing books. With the Internet, however, real time data-integration is readily available at low cost. The combination of the physical concept of drop shipping with the information integration made possible by the Internet resolves the problems that previously limited the use of drop shipping.

Ernst and Young study [68] of Internet retailers indicates that 30.6% of Internet-only retailers use drop shipping as a primary way to fulfill orders, while only 5.1% of multi-channel retailers primarily rely on drop shipping.

A new coordination scheme has been proposed (Nils Rudi et. al. October 2000) [66] where, in addition to using a returns contract (for the traditional supply chain structure) or a penalty scheme (for the drop shipping structure), the wholesaler subsidizes a part of the retailer's marketing expenses. Extensive comments are provided on the comparative benefits of traditional and drop shipping supply chains. Some companies do not hold/ own any inventory of CDs and Cassettes. Instead, they partnered with a wholesaler, which stock CDs/Cassettes ships them directly to the company's customers. In this way, the retailer avoids inventory investment, since it only pays the distributor for sold products. They call it Consumer Direct Fulfillment. Cdnw.com electronically sends orders to its distributors about three times a day. The distributors then ship the merchandise from their warehouses to the customer. Internet CD sellers generally do not have inventory, although video seller Reel.com does have some. This may be the future trend as online CD merchants gain sales volume.

One of the major differences between selling goods on the Internet and through the conventional brick-and-mortar retailer is the disintermediation of physical goods flow and information flow. In a physical store, a customer selects a product and pays for it at the same time and place that she physically receives the product. On the Internet this does not need to be the case. A customer on the Internet can not observe from where the product is dispatched. Further, Internet customers (similar to mail order catalog customers) do not expect an immediate delivery of the product. Together, this allows the retailer and the wholesaler to adopt the drop shipping agreement efficiently at a low cost. Agreements of this type benefit the retailer by eliminating inventory-holding costs and overall up-front capital required starting the company. The wholesaler increases her involvement in the supply chain and hence can potentially demand a higher wholesale price, thus capturing more profits. Further, supply chain benefits occur due to risk pooling if the wholesaler performs drop shipping for multiple retailers. Finally, each party can concentrate all its resources on one task: the retailer on customer acquisition and the wholesaler on product distribution.

Despite several clearly attractive features, drop shipping introduces new inefficiencies into the supply chain. Under drop shipping, the wholesaler keeps the decision rights related to stocking policies, while the retailer's main task in the supply chain is customer acquisition. This separation of marketing and operations functions results in inefficiencies, some of which have been the subject of discussion in the literature on marketing-operations coordination. Many questions arise in such a situation: will the supply chain performance under the drop shipping structure be better than under a traditional structure in which the retailer holds inventory? Further, is it profitable for both the retailer and the wholesaler to engage into this sort of agreement? Can drop-shipping agreements lead to system-optimal performance, and if not, what form of Contract can coordinate the supply chain?

### 2.3.1 Supply Chain in Music Industry

The music industry was born about a century ago when technological innovations allowed capturing, storing and replaying sound. Storage media technology evolved from vinyl (physical, vibration based) to audiocassettes (magnetic) to CDs and mini-discs (digital). During transitions, industry players either quickly adapted to the changes or simply vanished from the scene. Today, the industry is again on the verge of major change brought by the rapid evolution of the internet and the merger of audio and computing technologies (Mihir Parikh 1999) [45].

Current industry structure is built around three major processes:

- *Creation of music*: musicians, lyricists, and recording artists with creativity and talent create music. This is a creative process, but it also requires collaboration and coordination among a diverse set of entities.
- *Marketing of music*: Marketing includes branding, information dissemination and community building. Major channels for branding and information dissemination are professional promoters, disk jockeys and dance clubs, television and radio stations. These channels propagate information about new releases and provide samples of music to the music lovers and potential customers. They also help develop communities of music fans with similar tastes. Another channel of branding is retailers who, in addition to selling music, sell promotional and associated merchandise.
- *Distribution of music*: Music is a “liquid” product. Unless it is stored on “containers” such as CDs and audiocassettes, it perishes. Retailers such as Planet-M, keep these

“containers” in their store for the music lovers to buy them as they would buy cloths and toys. Another method of music distribution is through private and public shows.

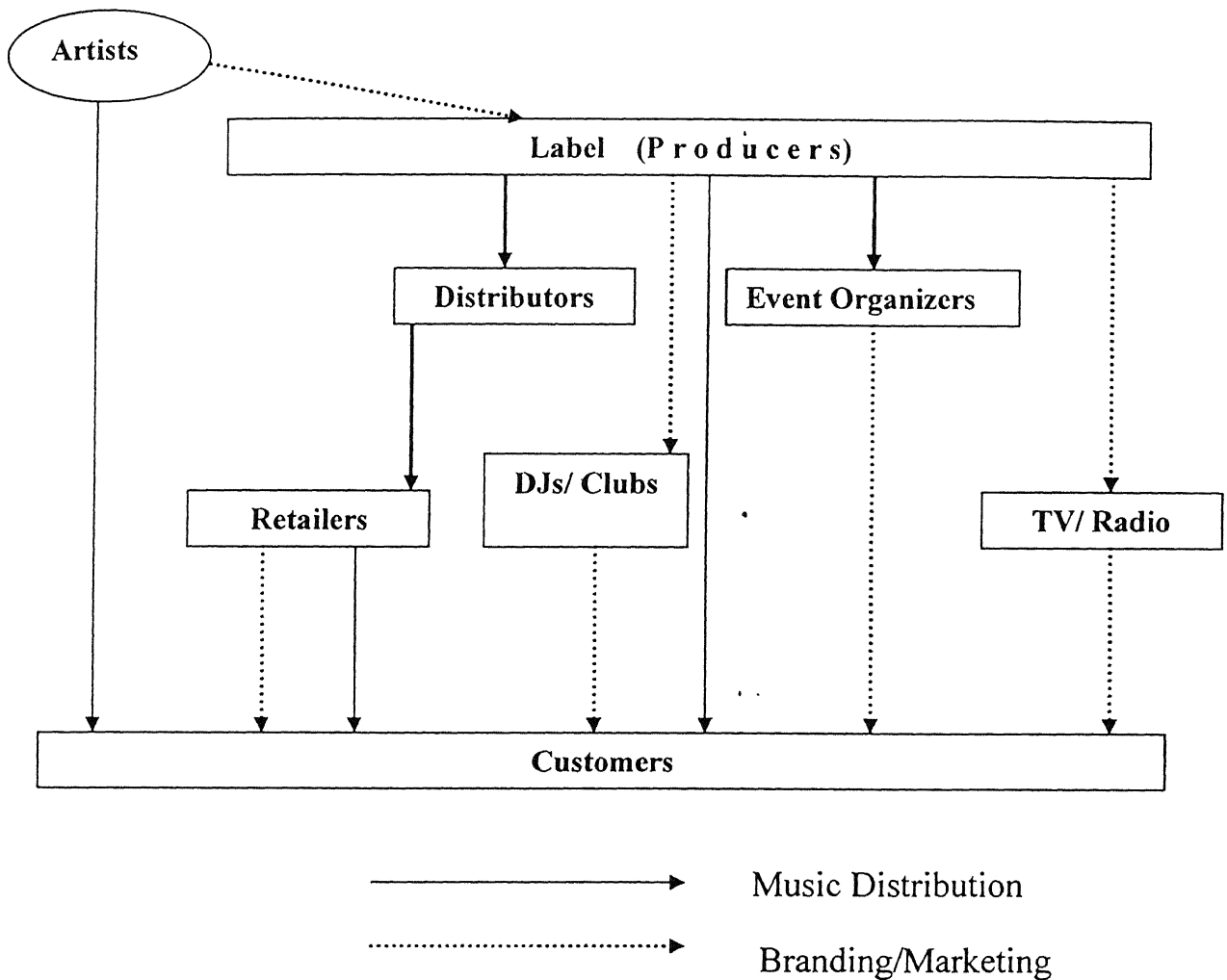


Figure: 2.2 Music Industry Structure (Source: Mihir Parikh 1999) [33]

### 2.3.2 Inventory

The effort of researchers on supply chain can be broadly classified into two categories: first, collaborative-design-intensive, second, distributive and inventory management intensive.

The impact of retail assortment on inventory management and customer service has been studied by (Stephen smith et. al. 1998) [69]. They developed a method to determine the effect of substitution on the demand distributions for items, and for jointly selecting stock levels for an assortment of interrelated items. Methods are developed for jointly optimizing base stock levels for the multiple items, subject to constraints on target service level, or on resources such as inventory investment and display space.

Customer service, a key element of competitive strategy can be measured in different ways – delivery speed, cost, quality, customization, personal attention, product variety etc. A number of retailers have been successful by offering a wide selection of products. In this regard they have shown some examples from plastic and apparel industry as well as from grocery products. Offering a wide selection of products has many advantages from a marketing perspective, but it can increase inventory, shipping and merchandise presentation costs.

Operations management has a wealth of literature that deals with the inventory aspects of the supply chain. One of such a research is on, “Optimal  $(s, S)$  Inventory Policies for Levy Demand Processes” (Roundy et. al. 1996) [61]. They considered inventory models in which both time and inventory are modeled as continuous quantities, the lead times are deterministic, and customer service is modeled through cost minimization rather than constraints on service levels. For a more thorough discussion of the literature see (Zheng 1992 [83]). Also see (Gallego 1994 [20]) and (Axsater 1993 [3]).

The most popular model for  $(s, S)$  and  $(R, Q)$  policies is originally due to Hadley and Whitin (1963) [24]. This model has been the mainstay on introductory textbooks on inventory theory for over 20 years. See (Johnson and Montgomery 1974) [2], (Nahmias 1993 [50]) and (Vallman, Berry and Whybark 1992 [72]). This model assumes that the inventory position lands on the reorder point rather than jumping over it. So the distinction between  $(s, S)$  policies and  $(R, Q)$  policies disappears. This model also assumes that the inventory position is uniformly distributed between  $s$  and  $S$ .

Zheng developed an elegant  $(R, Q)$  inventory model (Zheng 1992 [83]). This model differs from that of Hadley and Whitin in that Zheng uses a time-weighted backorder cost of  $p$  dollars per item per day rather than  $p'$  dollars per item. Zheng assumes that the cumulative demand process is non-decreasing, has continuous sample paths, and has identically distributed increments. The continuity of the sample paths implies that the inventory position lands on the reorder point rather than jumping over it, and that the inventory position is uniformly distributed between  $s$  and  $S$ . As in the Hadley-Whitin [23] model, the distinction between  $(s, S)$  policies and  $(R, Q)$  policies disappears.

A primary goal of the research (Roundy et. al. 1996) [61] is to study some fundamental properties of Levy jump processes and to develop  $(s, S)$  policies for these processes.

jump processes are a realistic and rich class of stochastic processes in which the inventory position usually jumps over the reorder point rather than landing exactly on it. They studied some relevant properties of these processes and developed a quadratically convergent algorithm for finding optimal  $(s, S)$  policies and discussed service levels. They developed a simpler policy called the Mass Uniform heuristic, and derive a bound on its relative costs.

## 2.4 Research in Demand Models

The purpose of demand models is to measure the “demand” for a product as a function various independent variables. The word demand here should be interpreted broadly. It is not necessary units demanded but could be some other variable that is related to units demanded. For example, in conjoint measurement models, the demand variable an individual’s preference for a choice alternative. In Bass’s (1969) [8] model of diffusion, the demand variable is “sales to first adopter”. The independent variables in measurement models are usually marketing mix variables- again interpreted broadly to mean any variables the firm controls.

Because marketing systems are too complex to manage in all their details, people deal with models of them. There are essentially three purposes for modeling: measurement, decision support, and explanation of theory building.

There are a large number of issues that should be considered before selecting the appropriate marketing models:

- Mathematical form: Is the model linear? Nonlinear but linearizable? Inherently nonlinear?
- Static/ Dynamic: Does the model deal with a flow of actions and responses over time or does it represent a static snapshot?
- Deterministic/probabilistic: Nothing is known with certainty. Whether a deterministic model is used as an approximation of a stochastic model is used as an approximation or a stochastic model is used explicitly is a matter of model building style.
- Aggregate versus individual: Individual response can be modeled and then aggregated to the market level or total market response can be modeled directly.
- Level of demand: Models can deal with the sales of a brand, the sales of the product class or the market share of the brand

### 2.4.1 The Adoption Process for New Products

The theory of the diffusion of innovations addresses how a new idea, a new good, or a service is assimilated into a social system over time. The diffusion process is the spread of an idea or the penetration of a market by a new product from its source of creation to its ultimate users or adopters, while the adoption process is the steps an individual goes through from the time he hears about an innovation until final adoption, the decision to use an innovation regularly. The difference among individuals in their response to new ideas is called their innovativeness; it represents the degree to which an individual is relatively early or late in adopting a new product or idea (Midgley and Dowling, 1978 [44]).

Individuals can be classified by their influence on others with respect to innovation. Opinion leaders are those individuals from whom others seek information and advice and who therefore influence the action of later adopters. These concepts have important implications for modeling the adoption process. In the early stage of the process, innovators alone are involved in purchasing decisions. Later word of mouth from innovators increases likelihood of trial. However, as more try, there are fewer left who have not tried, and the rate of trial decreases. Bass's (1969) [8] model operationalized these concepts in a marketing framework. There have been many studies on how individuals react to new ideas and products. Rogers (1983)[62] attempts to synthesize over 3,000 studies of diffusion process and reaches the following conclusions:

First, he proposes that consumers go through a sequence of five stages when accepting and adopting a new product (Roger, 1983) [62]:

1. *Knowledge* occurs when an individual (or other decision maker unit) is exposed to the innovation's existence and gains some understanding of how it functions.
2. *Persuasion* occurs when an individual (or other decision maker unit) form a favorable or unfavorable attitude towards the innovation.
3. *Decision* occurs when an individual (or other decision maker unit) engages in activities that lead to a choice to adopt or reject the innovation.
4. *Implementation* occurs when an individual (or other decision maker unit) puts an innovation into use.

5. *Confirmation* occurs when an individual (or other decision maker unit) seeks reinforcement of an innovation decision already made, but he or she may reverse this previous decision if exposed to conflicting messages about the innovation.

Second, he reports that the rate of adoption of an innovation can be modeled as a function of that innovation's attributes. For example, other things being equal, an innovation will diffuse more quickly through a population if it:

- Has a strong relative advantage- a greater perceived value in terms of higher return on investment, reliability, ease of operation or whatever the relevant dimensions compared to the current product or products.(relative advantage)
- Has a high degree of compatibility: that is, it is consistent with the existing attitudes, values and operations of the individuals in the social system(compatibility)
- Is not complex.(complexity)
- Can be tried on a limited basis.(trialability)
- Is observable: that is, the results or benefits or the innovation are easily visible to others.(observability)

#### 2.4.2 Aggregate Diffusion Model: Model of First Purchase

The task of diffusion model is to produce a lifecycle sales curve based on (usually) a small number of parameters, which may or may not have behavioral content. The presupposition is that these parameters may be estimated either by analogy to the histories of similar new products introduced in the past, by consumer pretests, or by early sales returns as the new product enters the market.

The study of innovation diffusion has a long history. The much younger field of quantitative modeling of innovation diffusion in marketing started with the introduction of simple epidemic model by Bass (1969) [8]. In an important integrated effort in the marketing field, he combined the innovative and imitative components (in discrete-time form).

$$Q_t = \underbrace{p(\bar{Q} - N_t)}_{\text{Innovation effect}} + r \underbrace{\left(\frac{N_t}{\bar{Q}}\right)}_{\text{Imitation effect}} (\bar{Q} - N_t) = \left(p + r \frac{N_t}{\bar{Q}}\right) (\bar{Q} - N_t) \quad \dots\dots\dots(1)$$



Where,

$Q_t$  = number of adopters at time  $t$

$\bar{Q}$  = ultimate number of adopters

$N_t$  = cumulative number of adopters to date

$r$  = effect of each adopter on each nonadopter (coefficient of internal influence)

$p$  = individual conversion ratio in the absence of adopter's influence (coefficient of external influence)

One traditional interpretation of this model has both innovators and imitators buying the product. The innovators are not influenced in their purchase timing by the number of persons who have already bought, but they may be influenced by promotions. As the process continues, the relative number of innovators diminishes monotonically with time. Imitators are influenced by the number of previous buyers and increase relative to the number of innovators as the process continues. Bass's model was based on certain assumptions, among them most critical were that market potential remains constant over time and marketing actions do not affect the diffusion process. Jeuland (1981) [29] suggests a model where the individuals are heterogeneous with respect to "susceptibility". Each homogenous segment is described by equation (1), with rates varying across segments. The aggregate process that results is a generalization of equation (1).

Most of the research efforts in diffusion models in the last decade were directed at extending the Bass Model to include marketing mix variables. Horskey and Simmon (1983) [27] modified by parameter  $p$  in equation (1) to be a function of advertising and their estimation of the model produced encouraging results.

Monahan (1984) [47] has extended this model in a stochastic framework. An alternative formulation was introduced by Kalish (1985) [30] which incorporate pricing and advertising in the diffusion model, the two most frequently studied variables. In his model potential population is a function of price i.e.  $N = N(P)$ . Instead of one stage adoption process assumed by Bass in his model, Kalish assumes a two stage model, where the rate of adoption is determined by:

1. Awareness (information) diffusion, controlled by advertising and word of mouth.
2. Adoption within a (growing) potential adopter population, whose size depends on awareness, price, and uncertainty concerning product performance.

A second approach was introduced by Bass and Bultez (1982) [7]. They suggest that the rate of adoption is multiplicative as follows:

$$\overline{X} = f(P)g(t)$$

Where  $f(P)$  is decreasing in  $P$  and  $g(t)$  is an exogenous's curve as a function of time.

In sum, it is clear that considerable progress has been made in the field in the last three decades. After extensive search for an appropriate model for the game, we zeroed on to the model proposed by Kalish because of the following reasons:

- His model is consistent with established theories of individual behavior.
- It incorporates pricing and advertising in the diffusion model, the two most frequently studied marketing variables.
- Simple to understand and implement.

The explanation and implementation of this model is explained in the later chapter.

## 2.5 Research in Advertising Response Models

### 2.5.1 Advertising

One of the most important and bewildering promotional tool of modern marketing is advertising. No on doubt that it is effective in presenting information to potential buyers. There is also wide spread agreement that it can be persuasive to some extent and can improve reinforce buyer preference for a company's product.

Advertising is bewildering because, among other reasons, its effects typically play over time, may be nonlinear, and interacts with other elements in the marketing mix in creating sales. More specifically, the purpose of advertising is to enhance potential buyer's responses to the organization and its offering by providing information, by channeling desires, and by supplying reasons for preferring a particular organization's offer.

## 2.5.2 The Effects of Advertising

Response Phenomena: Little (1979) [40] identifies three sets of controversies for aggregate advertising response models:

*Shape:* This notion refers to the long-term level of sales expected at each different level of advertising. Is the relationship linear? S-shaped? What are the sales when advertising is zero? Is there a super saturation point, where large amounts of advertising depress sales?

*Dynamics:* This notion refers to the speed of sales increase when advertising is increased and the rate of decay when advertising is decreased. Also how advertising affects sales over time i.e. the immediate effect and the lagged effect or carryover effect of advertising.

*Interaction:* What is the appropriate structure of the interaction of advertising with other elements in the marketing mix?

## 2.5.3 Advertising Response Curve

Perhaps the most interesting set of controversies surrounds the shape of the response function. Logic demands that a linear or everywhere-convex is unreasonable: a product with linear response would have an optimal advertising rate at either 0 or infinity; a convex response curve would lead to (optimal) infinity spending with sales becoming arbitrary large. The most commonly discussed advertising response curve shapes, then, are concave and S-shaped.

While a good deal of discussion and modeling concerns S-shaped response, most of the empirical evidence supports concavity. Reviews by Simon and Arndt (1980) [67] and Aaker and Carman (1982) [1] indicate diminishing returns; Lambin (1976) [37] reports that there is no S-shaped curve, based on his analysis of 107 brands in 16 product classes in 8 Western European countries.

The work of Rao and Miller (1975) [57] is consistent with an S-shaped response as is Wittink's (1977) [79] analysis, reporting larger advertising-sales slopes at higher advertising rates, implying a region of increasing returns as dictated by the S-shaped hypothesis.

Little (1979b) [40] summarizes his observations with a list of five phenomena that a good advertising response model should admit:

1. Sales response dynamically upward and downward, respectively, to increases and decreases of advertising and frequently do so at different rates.
2. Steady state response can be concave or S-shaped and will often have positive sales at zero advertising.
3. Competitive advertising affects sales.
4. The dollar effectiveness of advertising can change over time as the result of changes in media, copy, and other factors.
5. Products sometimes respond to increase advertising with a sales increase that falls off even as advertising is held constant.

## **Chapter 3: Framework and Implementation of Simulation Game Model**

### **3.1 Designing of Game**

Designing a game involves compromise, deciding what to include as well as what to leave out. A game is a model of some segment of reality and a model implies abstraction: the inclusion of relevant items, the omission of irreverent details. Some of the constraints that may occur while designing a game are described below. (Kibbee, et al, 1962)[24].

#### **The four constraints**

The four constraints in game designing are:

- Objective/Purpose
- Simplicity
- Verisimilitude
- Reality

#### **3.1.1 Objective**

To develop management learning tool for learning concepts of Online retailing and multi channel retailing in every aspect of business including marketing, supply chain management, operations management, retailing etc.

##### **Purpose:**

To enable the players gain insight about various intricacies in running a business that one cannot get from courses or case studies, to enhance decision making power and confidence among the players and to get them familiar with the various crucial factors in the business.

#### **3.1.2 Simplicity**

The need for simplicity can be an extremely important constraint on the model and can often make it difficult to satisfy all the requirements of stated objective. There are at least three facets of simplicity, and they can often be in conflict with each other.

These are- *simplicity of participation*; *simplicity of abstraction*; and *simplicity of administration*.

Since the intent of this game is to impart learning about business environment in the new information age, therefore to simplify the model and at the same time keeping in view the current trends in online retailing only music products are included in the model. Since current trends in B2C indicates multi channel retailing is going to dominate in the future (Ernst and Young, 2001)[44] therefore the game model also includes multi-channel retailing. An attempt has been made to cover all the basic types of supply chains into four standard supply chains to impart all the basic learning's of supply chain. The inventory control model included in the game is based on (s, S) policy and EOQ model is deliberately removed from the game to simplify the game.

While developing this game some major considerations are deliberately removed from the game model to impart easy learning to the players while at the same time every effort is done to include all the practical intricacies to give a good learning to the players.

### **3.1.3 Verisimilitude and Realism**

Verisimilitude is the appearance of reality to the player, but this does not necessary imply the realism of the model. To sustain involvement, all the player must not be distracted by too obvious artificiality of the model. However, as is well known in the context of theatre, an illusion of reality can be sometimes be more convincing then the reality itself. (Kibbee, et al., 1962)[24]

The degree of realism needed in the model depends on the training objectives. The purpose of this game is to exemplify certain management and decision making skills such as analysis, planning, concepts of marketing, retailing etc.

A common game objective is that players learns to benefit from experience, and thus are able to deduct relationship between various different measures of performance.

### **3.2 Methodology**

The whole process of designing this game is based on four information gathering steps:

- I. The first step was to conduct an extensive survey of all the games that are available in the market or that are used in various universities across the world to gather information regarding the types of games that are currently available, their main area of focus and to learn their methodology in imparting learning to the players. While doing this we found that while there exists so many games but none exists that provides a common platform of learning all areas of business administration in the new information age. Therefore a need to develop a game that will integrate all aspects of business in e-commerce environment was felt.
- II. In the second step, an extensive review of literature in context of e-marketing, supply-chain, retailing, e-commerce, online-retailing, multi channel retailing was conducted to get familiar with all the existing models in various different streams. The review helped in filling many knowledge gaps in relating between these separate streams of research.
- III. In the third step, a study of various web sites was conducted to get an idea about what are the different products that are offered in online medium and which are preferred by the consumers, about their revenue generating models, what are the factors of success, and services that these sites provide that differentiate them from their competitors.
- IV. The final step involved identifying a particular product from the vast range of products that are being offered on line. Out of so many products books and music products are the one that are most purchased online. So finally the selected products are CD's and cassettes.

### **3.3 Model Development**

Systems models can be classified into physical and mathematical, static and dynamic, and numerical and analytical. The model that is developed here is simulation model, which is dynamic in nature and allows numerical calculations of various process parameters.

Steps in developing the model:

- I. In the first phase of developing the game; a simulation model is developed that simulates all the activities from arrival of customer up to the departure of customer, customer order fulfillment, inventory management and procurement of goods. The various inputs for the simulation model are read from the data files that are the input of other modules. At the end of each period a report is generated that helps in evaluation of the players on the basis of some performance evaluation parameters.
- II. In the second phase of the developing the game, a *Marketing and Demand management* module, *Pricing and Retailing* module, and *Supply chain and Inventory Management* module are developed. The various strategic, tactical and operational decisions that players will take while playing the game will be the inputs to these modules and the output of these modules will be the input required for the simulation program.

### **3.4 The Supply Chain Model**

A simple supply chain can be defined as a network of autonomous or semi-autonomous business entities collectively responsible for procurement, manufacturing and distribution activities associated with one or more families of related products (Swaminathan et al, 1998). Developing a model of supply chain involves identification of all the entities that are present in the system. Different entities in a supply chain operate subject to different set of constraints and objectives. However these entities are highly interdependent when it comes to improving the performance in terms of objectives such as on-time quality assurance, delivery time and cost minimization. As a result, performance of any entity in a supply chain depends on the performance of others, and their willingness and ability to coordinate activities within the supply chain. Decision support tools that can analyze various alternatives can be very useful in impartial quantifying gains and helping the organization make the right decision.

Decisions related to supply chain designs are generally based on either qualitative analysis (such as benchmarking) or customized simulation analysis. This is because complex interactions between different entities and the multi-tiered structure of supply chains make it difficult to utilize closed form analytical solutions. Benchmarking



solutions provide insights into current trends but are not perspective. This leaves simulation as the only viable platform for detailed analysis for alternative solutions. (Swaminathan et al., 1998).

While designing supply chains for the game, it is kept in mind that enough flexibility should be given to the players to decide the number and types of participants in the supply chain. Decision on the number and type of participants will have impact on delivery times, costs, inventory level and service level.

The Four different types of Supply Chain provided in the game are:

- **Online In-house.**
- **Online Outsource –Single Order passing to Supplier.**
- **Online Outsource – Orders are clubbed together and then passed to the supplier.**
- **Online and Offline.**

#### **3.4.1 Online In-house**

The Player maintains inventory of each type of products and sub products for many varieties. The Player takes orders from customers through the Site/Portal. The player fulfills the orders taken by them from its own warehouses maintained at different locations.

The Player chooses his own Inventory Management Policy and selects suppliers from which he/she will receive goods to be stocked. The player supplies goods to the customer via a contracted carrier agency. The player selects the number of warehouses that he is going to maintain. The Player choice will have impact on the delivery time and service level but at the same time will increase his operational costs. Decisions regarding the number and type of suppliers will have impact on the inventory level, lead times and costs. Flow diagram is shown in Figure 3.4.1.

#### **3.4.2 Online Outsource – Single Order passing to the Supplier**

*Outsourcing is moving some of a firm's internal activities and decision responsibility to outside providers. Companies have a variety of reasons for outsourcing but primarily the reasons are to reduce costs and create a competitive advantage.*

In this supply chain model the player takes orders from customers through the Site/Portal maintained by him. The player passes those orders directly to suppliers. The supplier then fulfills the orders from their own warehouse to the customer. The customer pays Money to the Online Retailer while Retailer pays to Suppliers. Flow diagram is shown in Figure 3.4.2.

### **3.4.3 Online Outsource – Clubbing of Orders**

This is another type of outsourcing in which the player takes orders from customers through the Site/Portal maintained by him/her. The player accumulates the orders and places it to the different supplier to avail volume discounts and transportation economies of scale. After receiving goods from the suppliers, the player dispatches the customer's orders to the customers through courier. The player does not maintain any inventory and orders only that much amount for which he/she receives orders from the customers. Flow diagram is shown in Figure 3.4.3.

### **3.4.4 Online and Offline**

This option is given to the players to teach them concepts of multi channel retailing. The player will have stores at different places as well as have online presence through his Site/Portal. Player sells Cassettes and CDs offline as well as take orders via Portal / Site and then fulfill those orders from his/her store.

The player maintains reasonable amount of inventory in his/her Warehouses/Stores. The player has options to buy goods (Cassettes and CDs) from different types of suppliers. Flow diagram is shown in Figure 3.4.4.

## **3.5 Model Implementation**

The framework of simulation model is implemented using JAVA, an object oriented language.

### **3.5.1 Input to the Program**

The input required to run the simulation program are the output of *marketing and demand management* modules, *retailing and pricing* modules and *supply chain and inventory management* modules.

- 1) Arrival rates of new and repeat customers.
- 2) Number of Products offered.

- 3) Number of Sub-Products offered.
- 4) Number of Varieties offered.
- 5) Purchase Probabilities of each item.
- 6) Number of Warehouses and/or Stores maintained.
- 7) Number and type of Delivery Modes offered and there attributes.
- 8) Number and types of Payment Modes offered and their attributes.
- 9) Number and types of Suppliers and their attributes.
- 10) Inventory Management Policy.
- 11) Selling Price.
- 12) Advertising and Promotional Expenditure.
- 13) Bank Loans.

### **3.5.2 Online-In-house**

Events which are going to take place in the simulation program while simulating different processes in this supply chain are given below:

#### **Events in Simulation Program**

- I. Getting a Customer Order Online.
- II. Dispatching a Customer Order.
- III. Inventory Evaluation at each Warehouse.
- IV. Selection of a supplier and making a Purchase Order at each Warehouse.
- V. Goods Arrival at each Warehouse.
- VI. Financial Data.
- VII. Report Generation.

### **3.5.3 Online Outsource – Single Order passing to the Supplier**

Events which are going to take place in the simulation program while simulating different processes in this supply chain are given below:

#### **Events in Simulation Program**

- I. Getting a Customer Order Online.
- II. Selecting a supplier and Passing a Customer Order to the Supplier.
- III. Checking whether Order is fulfilled or not.
- IV. Financial Data.
- V. Report Generation.

### **3.5.4 Online Outsource – Clubbing of Orders**

Events which are going to take place in the simulation program while simulating different processes in this supply chain are given below:

#### **Events in Simulation Program**

- I. Getting Customer Orders Online.
- II. Breaking the Customer Orders and Making Purchase Orders.
- III. Good Arrival.
- IV. Dispatching Customer Orders.
- V. Financial Data.
- VI. Report Generation.

### **3.5.5 Online and Offline both**

Events which are going to take place in the simulation program while simulating different processes in this supply chain are given below:

#### **Events in Simulation Program**

- I. Getting a Customer Order Online or Offline.
- II. Dispatching Customer Orders Online.
- III. Dispatching a Customer Order Offline.
- IV. Inventory Evaluation at each Store/Warehouse.
- V. Selection of a supplier and making a Purchase Order at each Store/Warehouse.
- VI. Goods Arrival at each Store/Warehouse.
- VII. Financial Data.
- VIII. Report Generation.

## **3.6 Events Description**

The events which are going to take place in the simulation model are described below:

### **3.6.1 Event 1: Getting a Customer Order**

The process followed in getting a customer order offline and online are given below and the flow chart is shown in Figure3.6.1.

#### **3.6.1.1 Arrival Of Customer**

Two Streams are created for the arrival of customers

**3.6.1.1.1 Arrival Online:** This stream generates customers for the website launched by the player. This stream is divided into two parts:

- **New Customers Arrival:** Generates customers who will visit the website first time.
- **Repeat Customer Arrival:** Generates customers who previously visited the web site and purchased something from the site.

**3.6.1.1.2 Arrival Offline:** This stream generates customers for the retail shops opened by the player at different locations in the country. This stream is divided into two parts:

- **New Customers Arrival:** Generates customers who will visit the shop first time.
- **Repeat Customer Arrival:** Generates customers who previously visited the shop and purchased something from the shop.

#### **Process of Generation of Customer Arrival Streams**

In the simulation program, the mean inter-arrival time of each different stream is calculated from the model of first and repeat purchase implemented and explained in the next chapter.

The mean inter-arrival time of each different stream is the input to a Probability Distribution Function (Exponential, Poisson etc) and output of that will be the arrival of customer at time  $t$ . Flow chart is shown in Figure 3.6.1.1

#### **3.6.1.2 Selection of Products**

##### **3.6.1.2.1 Process of Selection of Products Offline Steps**

- I After customer arrives, determine on which shop (at a particular location) he arrives.
- II In the selection process, each product that a Player is going to offer in that shop will have some “purchase probability” (depends on the market share, promotion offered, product range offered) associated with it. How many items a customer is going to buy is calculated from the repeat purchase model described in the next chapter. Customer selects the products from the shop.

III Then total cost is calculated by reading Prices of products (as decided by the players pricing policy. Then the option is given to the customer:

- **Modify the order:** If a customer chooses to modify the order then the selection process is repeated again.
- **Cancel the order:** If a customer cancels the order then terminate the selection process.
- **Confirm the order:** If a customer confirms the order then make a Customer Order.

Flow chart is shown in Figure3.6.1.2

#### **3.6.1.2.2 Process of Selection of Products Online**

The process of Product Selection starts after customer arrival. In the selection process, each product that a Player is going to offer in his site will have some “purchase probability” (depends on the market share, promotion offered, and product range offered). How many items a customer is going to buy is calculated from the repeat purchase model described in the next chapter. Customer selects the products from the shop.

#### **3.6.1.3 Process of Selection of Delivery Type Online**

1. After the selection is done, the customer selects the “Delivery Mode” (only if the customer is online) which a player is offering on his site. The various attributes of Delivery mode are:
  - **Delivery type:** Indicating the name of delivery type.
  - **Delivery cost:** The cost that will be charged from the customer if customer selects this delivery mode (depends on units purchased).
  - **Delivery time:** There will be some time within which the products will be delivered to the customer.
2. After a customer selects a particular delivery type, total delivery cost for that delivery type is calculated by reading the delivery cost from the delivery price set by the player.
3. Total cost is calculated by adding Prices of products as decided by the player and delivery cost is added to the products cost. Then the option is given to the customer:

- **Modify the order:** If a customer chooses to modify the order then the selection process is repeated again.
- **Cancel the order:** If a customer cancels the order then terminate the selection process.
- **Confirm the order:** If a customer confirms the order then make a Customer Order.

#### **3.6.1.4 Payment Mode Selection**

After confirmation of the order a customer selects the payment mode that a player is offering to its customers. The attributes of a payment mode are:

- **Fixed Cost:** The cost that the played has to pay for offering this payment mode to the customers.
- **Operational Cost:** The cost that the player has to pay for each transaction to the concerned agencies.
- **Realization Time:** The delay associated with each payment mode type in realizing the payment.
- **Default Rate:** The probability of default associated with each payment mode type.
- **Selection Probability:** The probability that a customer select this payment mode.

The value of attributes of each different payment mode that a player is offering is set by the instructor. Flow chart is shown in Figure3.6.1.4

#### **3.6.1.5 Making a Customer Order**

After a customer confirms the order then a Customer Order is made. A Customer Order consists of:

- **Channel:** From which channel customer arrives.
- **Day Number:** At which day customer arrives.
- **Customer Number:** This is customer number at a particular day.
- **Partial Order:** Whether a customer will accept partial order or not.
- **Item Code:** Item codes that a customer purchased.
- **Item Price:** Price of each item purchased.
- **Total Quantity:** Total quantity purchased.

- **Discount:** Discount offered to the customer.
- **Payment Mode:** Payment mode selected by the customer.
- **Delivery Mode:** Delivery mode selected by the customer.
- **Delivery cost:** Delivery price of the order.
- **Total Price:** Total price of the order.

The Corresponding Customer Order is added to the queue.

### **3.6.2 Event 2: Customer Order Fulfillment Offline**

This event will take place only if a player choose Supply Chain number 4 i.e. he goes for both online and offline medium.

#### **Steps**

- I. After the Customer Order is made, inventory check is done at the same time to determine whether those items are in stock or not.
- II. If all the items are available then the Purchase Order is fulfilled else determine how many items are available. Then customer is asked whether he will accept “Partial Order” or not.
- III. The probability that a customer accepts partial order in a shop is calculated by assuming that the ratio of Number of items available to the number of items demanded is equal to the acceptance probability.
- IV. If a customer accepts Partial Order then the Customer Order is modified and the products are decreased from the inventory.
- V. The corresponding amount is added to the Payment array where it is realized into Cash at the time of realization of Payment Mode selected by the customer.

Flow chart is shown in Figure3.6.2

### **3.6.3 Event 3: Customer Order Fulfillment and Dispatching Online**

This event will take place only if a player goes for Supply Chain 1, 3 or 4 i.e. he either goes for Online-In-house or Online-Clubbing of Orders and Passing to the supplier, or, he goes for Online and Offline both.

#### **Steps**

- I. All the orders received within a day are clubbed and fulfillment and dispatching is done in the evening in the sequence in which orders are received.
- II. Take Customer Orders one by one and determine whether those items are in stock or not. If all the items are available then the items are packed and send to



the courier. The corresponding amount is added to the Payment array where it is realized into Cash at the time of realization of Payment Mode selected by the customer.

- III. If all the items are not in the stock then check whether the Purchase Order is already delayed by the maximum delay allowed by the corresponding delivery type, if no, freeze those items that are available and increase the delay of Purchase Order by one day.
- IV. If the Purchase Order is already delayed by the maximum delay allowed by the corresponding delivery type, then see whether Customer will accept partial order or not, if yes then calculate the number of items available in stock, if those items are more than the Partial Delivery Policy of the Player then modify the Purchase Order, pack the items and send to the courier. The corresponding amount is added to the Payment array where it is realized into Cash at the time of realization of Payment Mode selected by the customer.
- V. If Customer does not accept Partial Order or those items are not more than the Partial Delivery Policy of the Player then cancel the order.
- VI. The corresponding amount is added to the Payment array where it is realized into Cash at the time of realization of Payment Mode selected by the customer.

Flow chart is shown in Figure3.6.3

#### **3.6.4 Event 4: Dispatching of Orders from Supplier to Customers**

This event will take place only if a player chooses Supply Chain 2 i.e. he takes order and passes it directly to the supplier.

##### **Steps**

- I. The information from the supplier is passed to the player about number of orders fulfilled and which cannot be fulfilled.
- II. The orders that are fulfilled their corresponding amount are added to the Payment Queue where it is realized into Cash at the time of realization of Payment Mode selected by the customer and to the amount payable to the supplier after cutting the margin.
- III. The orders that are cancelled, their Customer Order are deleted and corresponding entries are modified.

Flow chart is shown in Figure3.6.4

### **3.6.5 Event 5: Inventory Evaluation**

This event will take place only if a player chooses Supply Chain 1 or 4 i.e. he either goes Online-In-house or goes Online and Offline.

#### **Steps**

- I. Check whether time is equal to the Inventory Review time.
- II. If yes then check for each warehouse/store whether the inventory level of each item is less than  $s$  of that item.
- III. If current inventory level of that item is less than  $s$  then calculate the amount to be ordered by subtracting the current inventory from  $S$  of that item.
- IV. Similarly calculate the amount to be ordered for each item at that Warehouse/Store.
- V. Repeat the same for all Warehouses and Stores.

Flow chart is shown in Figure3.6.5

### **3.6.6 Event 6: Supplier selection and making a Purchase Order**

This event will take place in all the business models,

#### **Steps**

- I. In case when player clubs order and then pass to the supplier, break all Purchase Orders and calculate the total amount of each item to be ordered.
- II. In case where player maintains inventory the amount to be ordered is already calculated in Inventory Evaluation Module.
- III. Now for each Warehouse/Store select suppliers on the basis of Supplier attributes such as item availability, lead time, Cost etc set by the instructor and make a Purchase Order for that supplier.
- IV. A Purchase Order includes
  - Supplier number.
  - Quantity of each item ordered.
  - Total Cost
  - Arrival time of the order.
- V. Send Purchase Orders to the respective suppliers.

Flow chart is shown in Figure3.6.6

### **3.6.7 Event 7: Goods Arrival**

This event will take place only if a player chooses Supply Chain 1, 3 or 4 i.e. he either goes Online-In-house or Online- Orders clubbing or goes Online and Offline.

#### **Steps**

- I. At each warehouse/store check whether the items which are supposed to be arrived today are arrived or not. The Goods which are supposed to be arrived today can be delayed due to many reasons such as supplier is not able to supply on time, transport strike etc.
- II. If the items are arrived then add the amount arrived at that warehouse/store to the current inventory level of those items.
- III. Increase the amount payable to that supplier by total cost of the Purchase Order arrived.
- IV. Repeat above steps for each warehouse/store.

Flow chart is shown in Figure3.6.7

### **3.6.8 Event 8: Financial Entries**

This event will take place in all the Supply Chains.

#### **Steps**

- (1) Inflow of Cash:

Cash increases by following ways.

- (a) Selling of goods for cash (In case of Physical store)
- (b) Payment received from different payment modes offered by the player to its customers.
- (c) Payment received from Courier Company, which is authorized to receive Cash on delivery
- (d) Loan received from Bank
- (e) Selling of assets

Cash will be immediately added in case of Physical store if order is dispatched. In case of Online, cash sell is not possible. So customer has to choose payment mode from the payment mode/s which is/are offered by player. Each payment mode has different realization time and different default rate. (Ex: Payment may be default because of fraud credit card used by customer). Payment which is due on a particular day may be delay for one day or more, depending on cash availability with respective

payment gateway Company or may be due to holiday in Bank/Post office. Payment Realization time, payment realization probability and payment default probability will be input by the instructor.

Cash can be increase by getting loan from bank. Cash can be generated by selling of assets (These two decisions will be taken by player and will be strategic decisions).

(2) Outflow of Cash

Cash is decreased by following ways.

- (a) Payment to supplier for goods received
- (b) Payment to Courier companies for services received
- (c) Payment of salary to staff
- (d) Overhead expenses (Like electricity bill, depreciation of assets, rent etc)
- (e) Interest payment to bank
- (f) Loan payment to bank (Decision of player)
- (g) Purchase of assets

Payment to suppliers, courier companies may be delay for one day or more depending cash availability. If payment delayed for more than specified time, interest will have to pay. Maximum allowable delay will be by the instructor.

Also cash is decreased (generally after end of month due to overhead expenses and salary for the staff. If player has taken loan from the bank, interest is paid to respective bank. If, there is enough cash, player can repay loan and can buy asset to increase customer base.

Flow chart is shown in Figure3.6.8

### **3.6.9 Event 9: Report Generation**

This event will take place in all the Supply Chains.

At the end of each period a report is generated that will display the values of all the performance measurement variables.

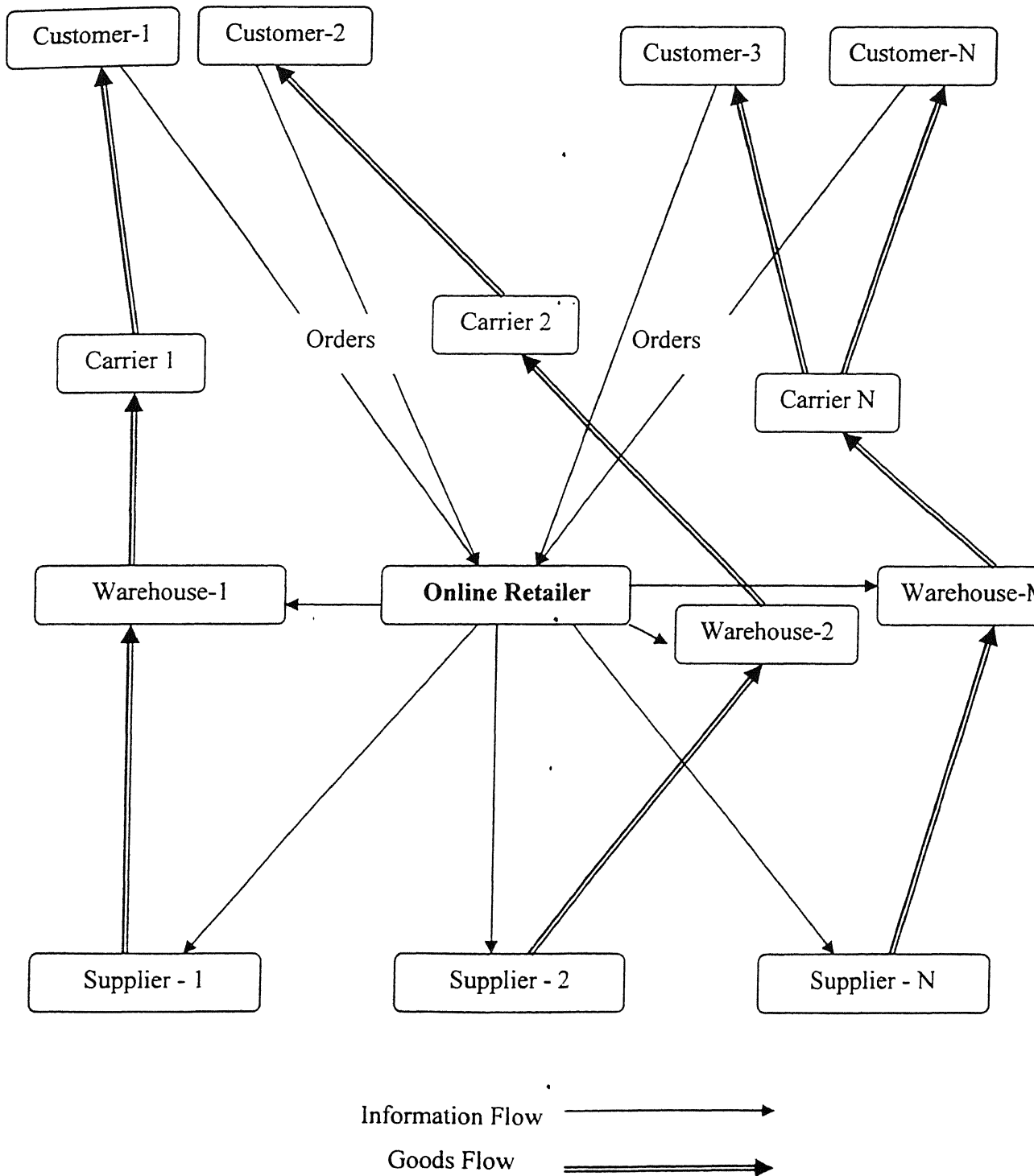
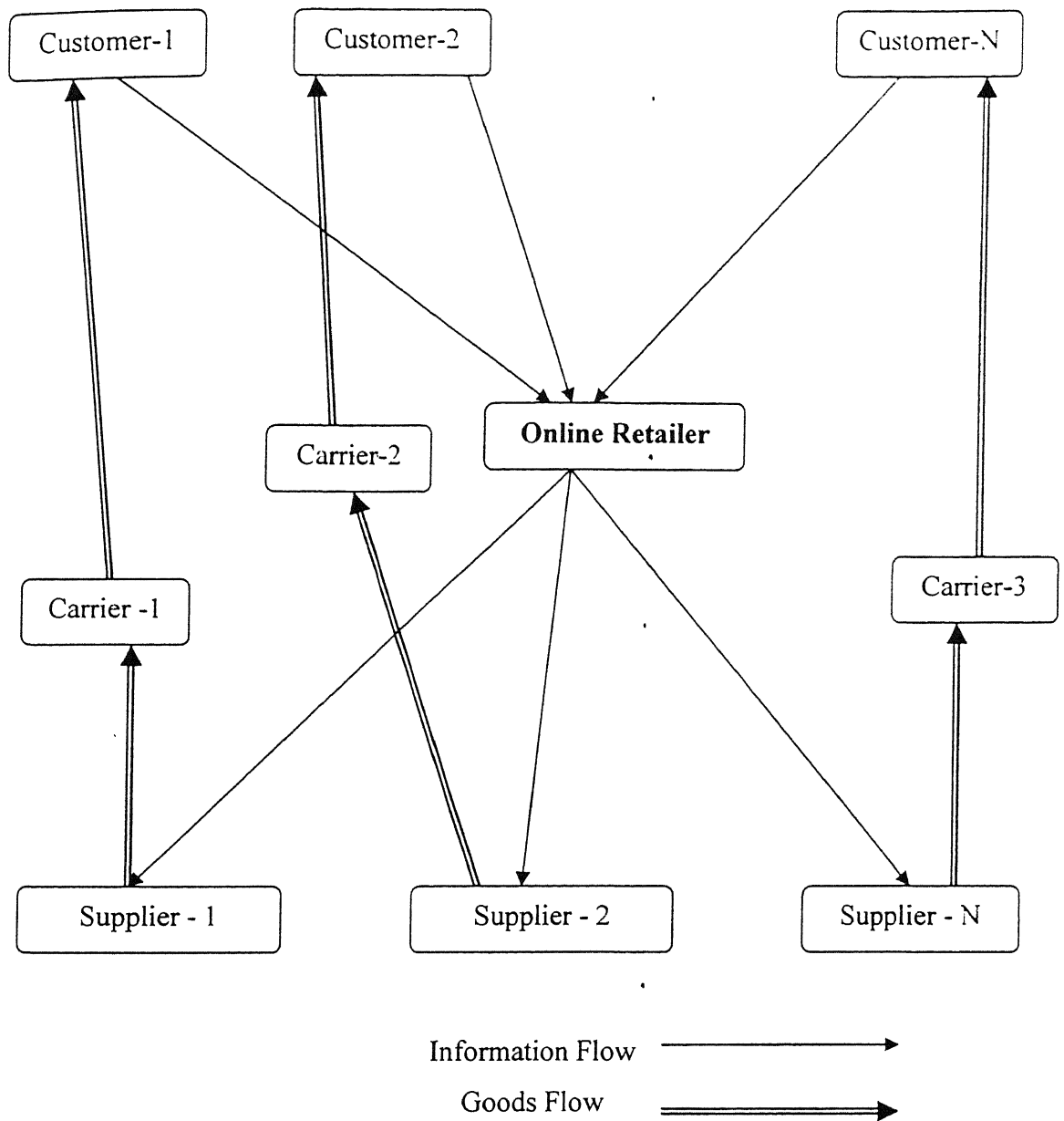
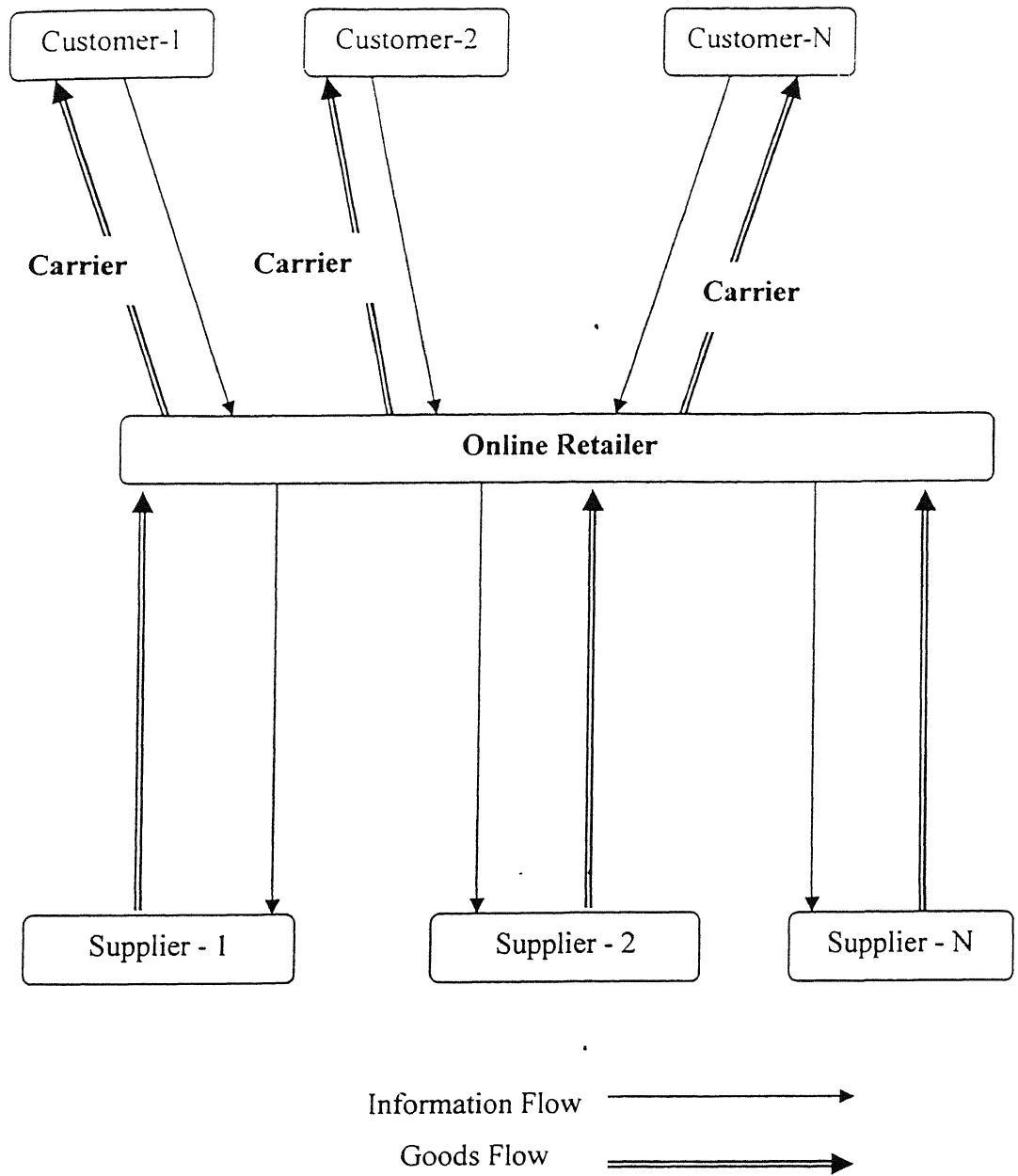


Figure 3.4.1: Online In-house



**Figure 3.4.2:** Online Outsource- Single Order Passing



**Figure 3.4.3: Online Outsource- Clubbing of Orders**

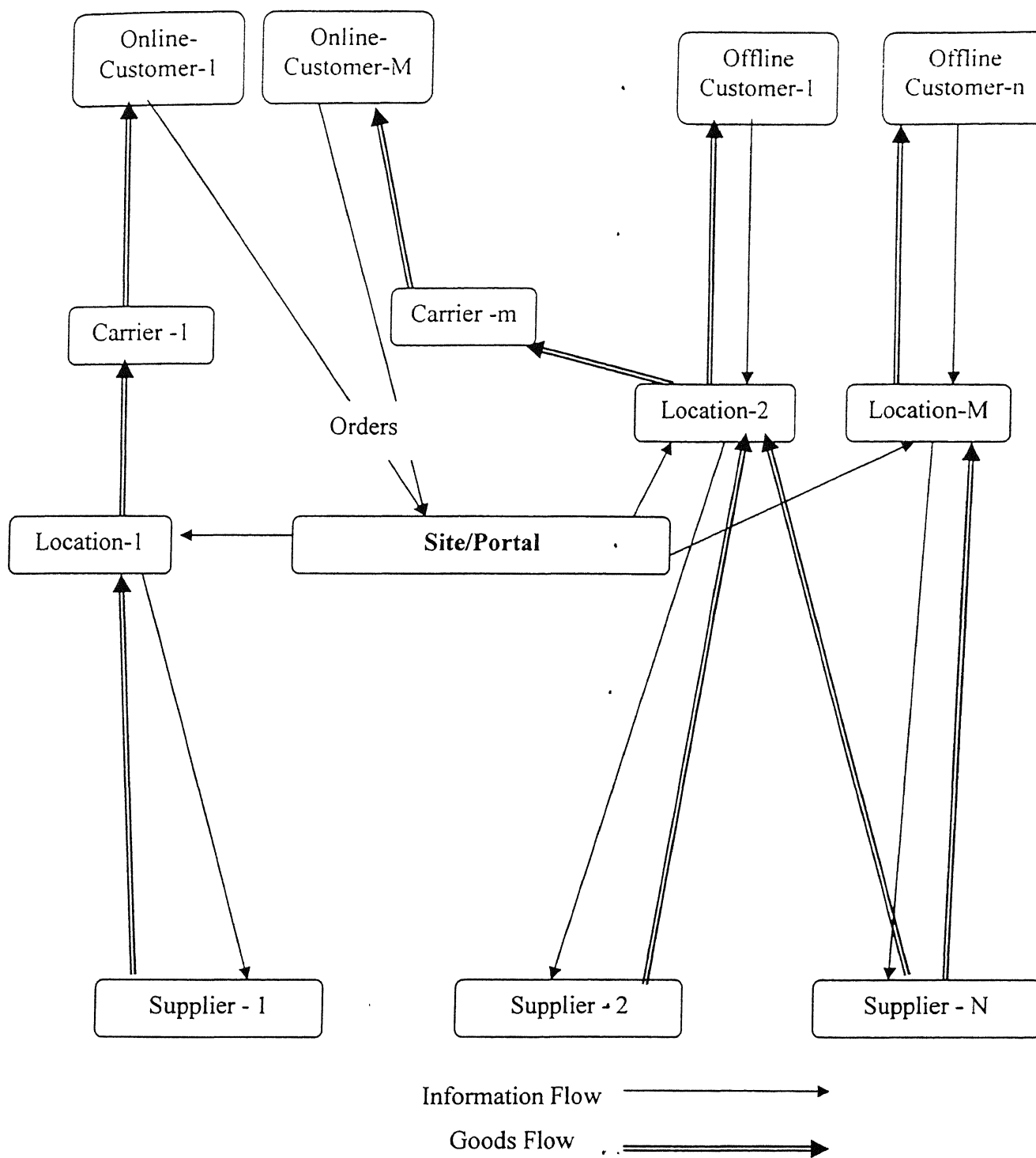
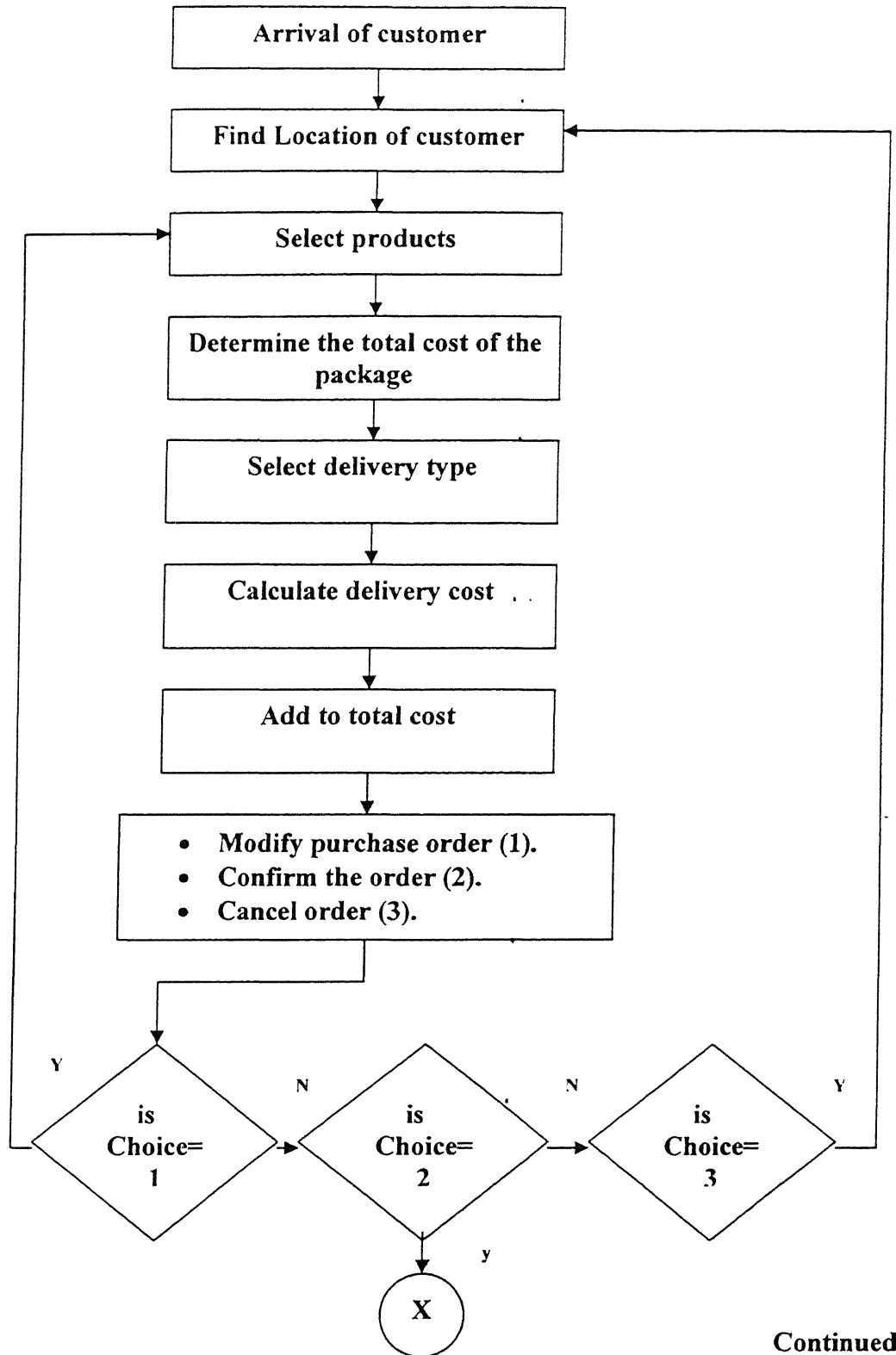
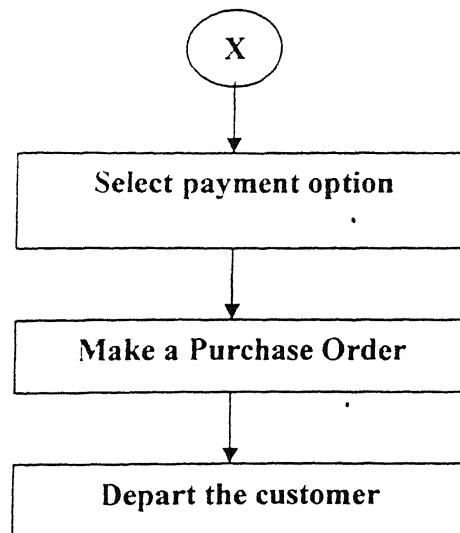


Figure 3.4.4: Online and Offline Both





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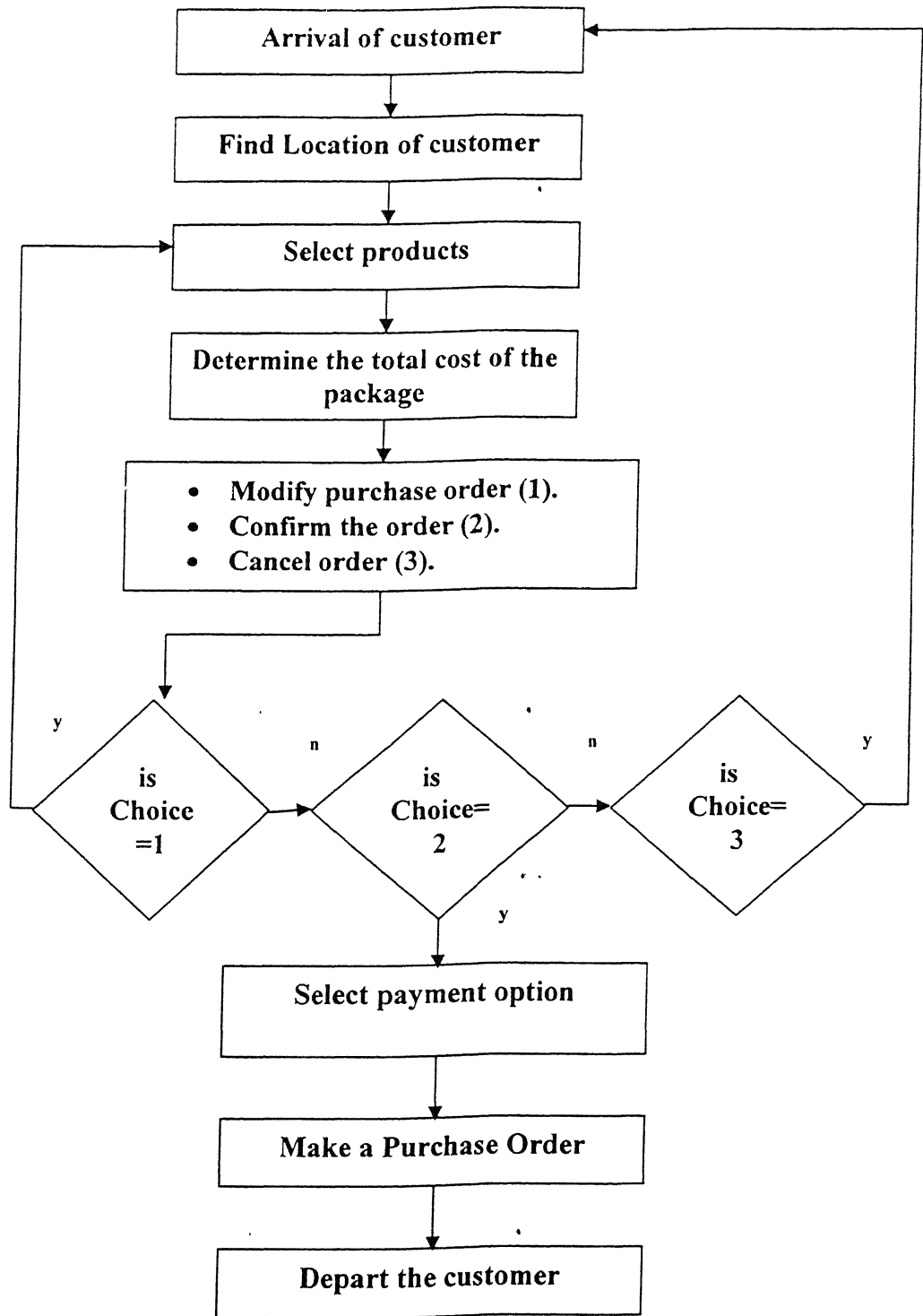
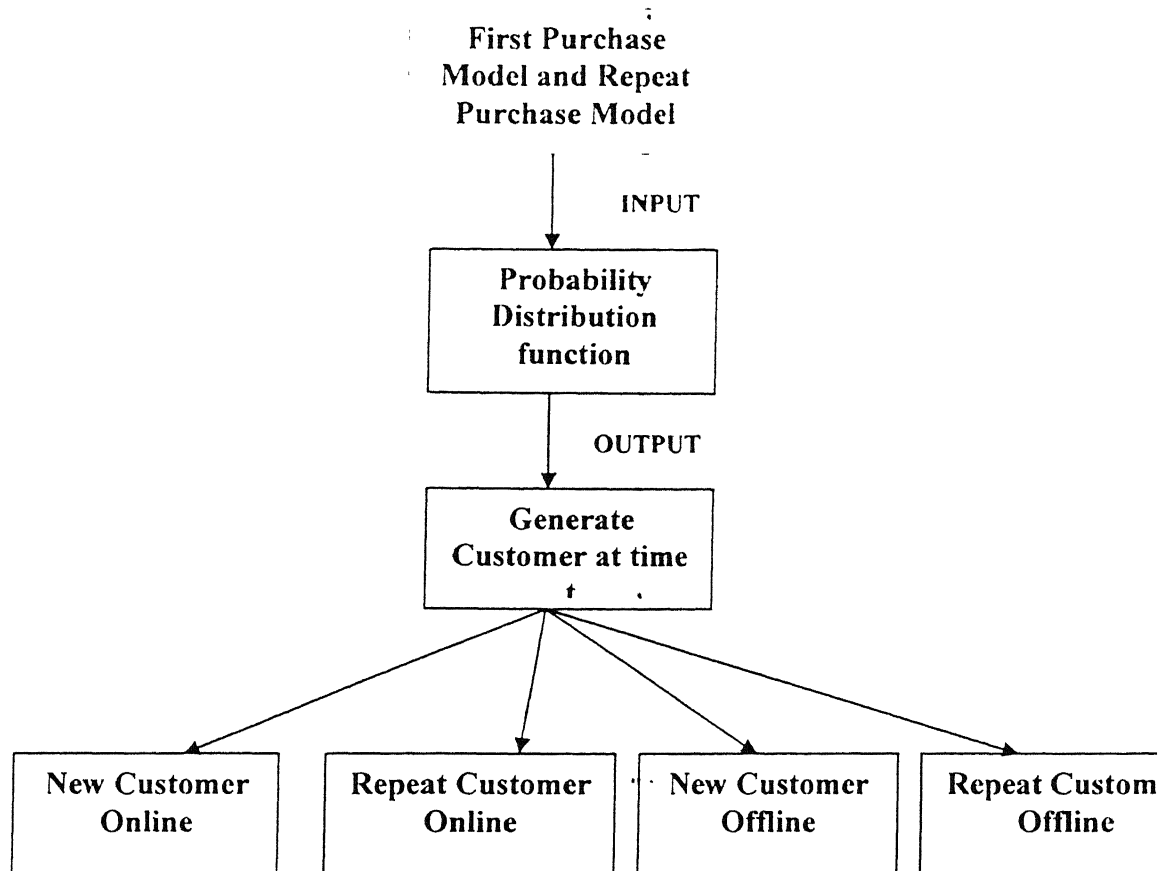


Figure 3.6.1: Process of getting a Customer Order



**Figure 3.6.1.1:** Process of Generating Arrival Stream

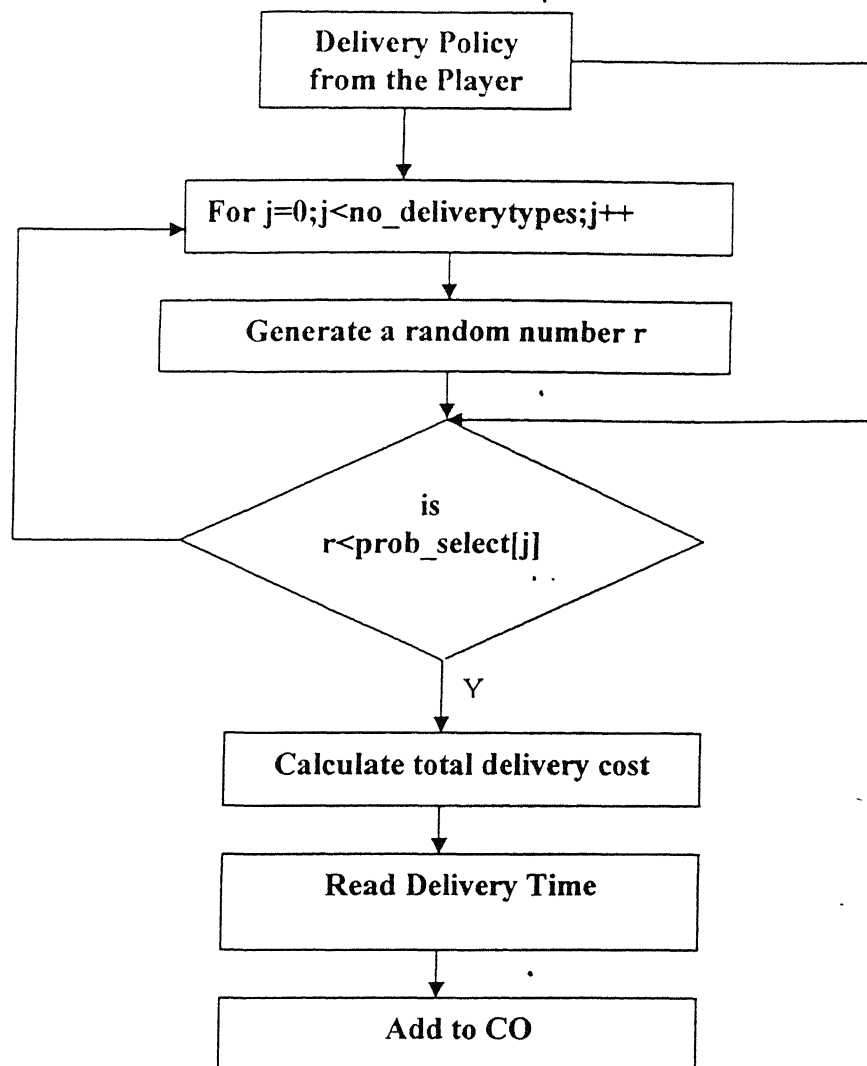


Figure 3.6.1.3: Process of Delivery Type Selection

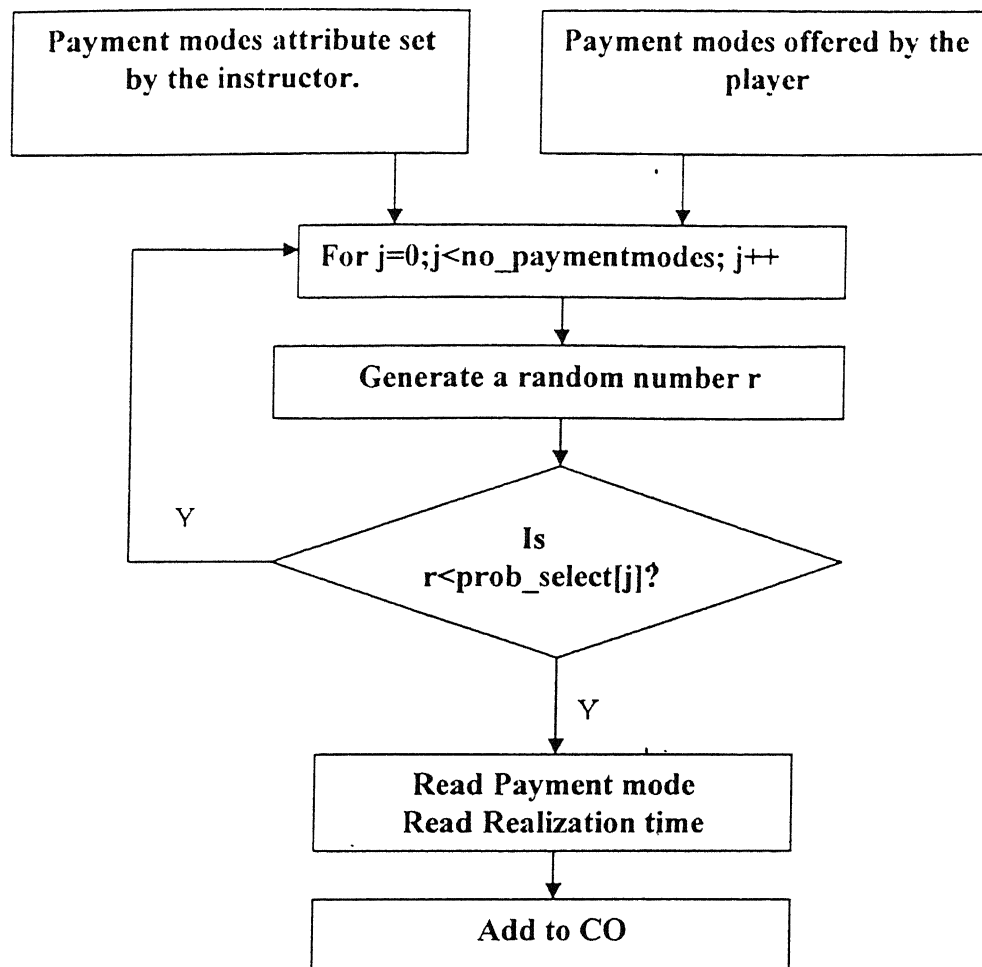
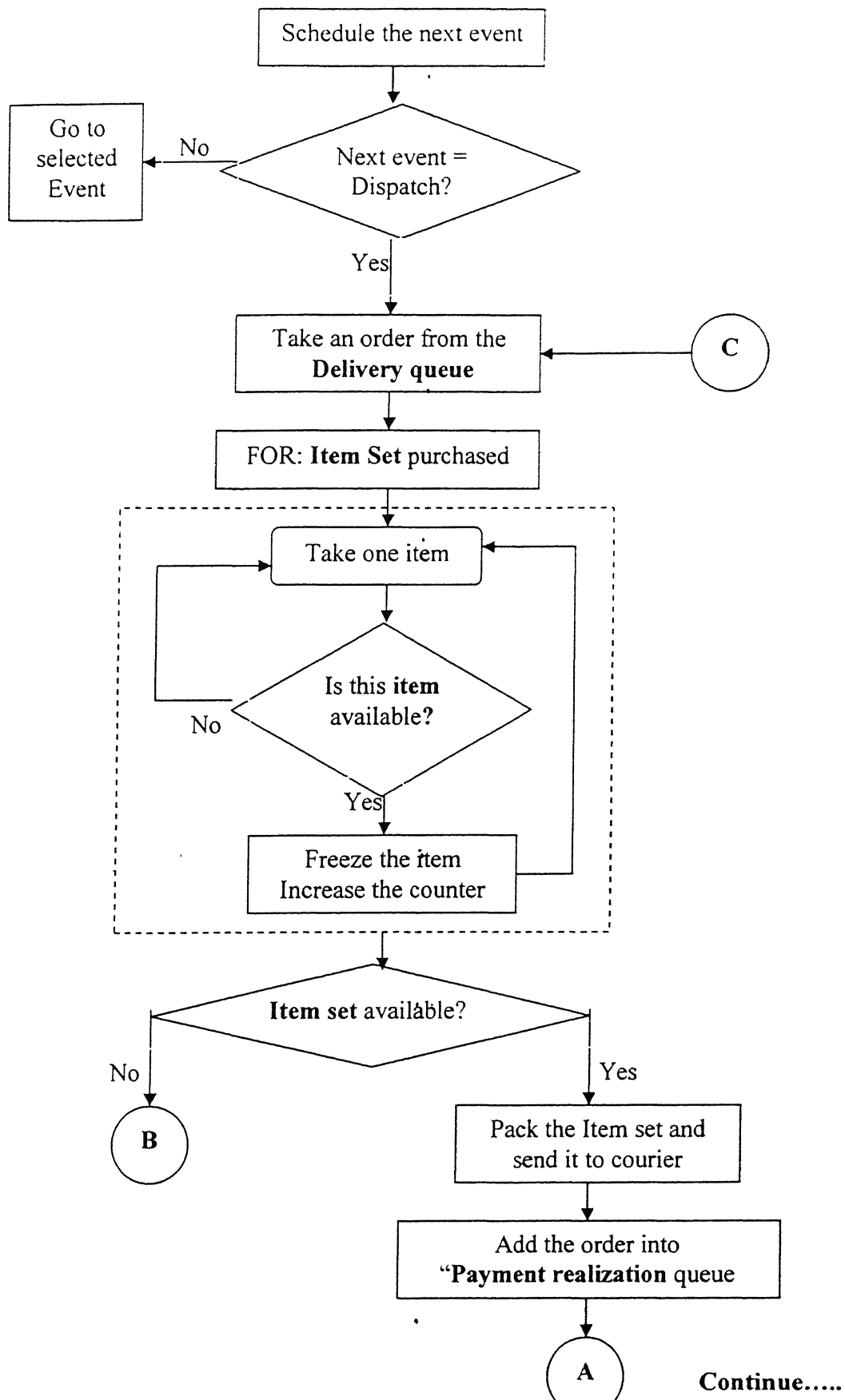
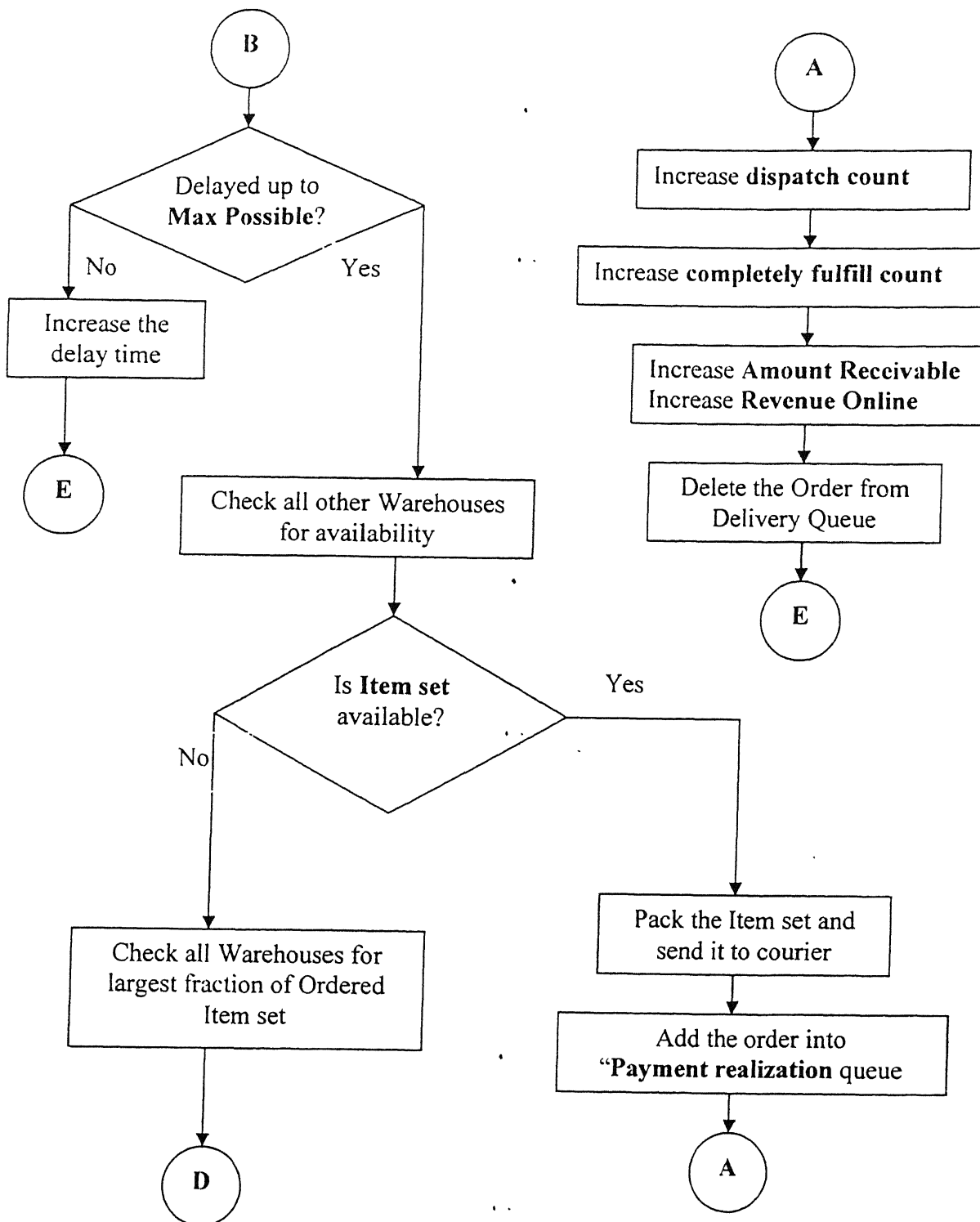


Figure 3.6.1.4: Process of Payment Mode Selection:





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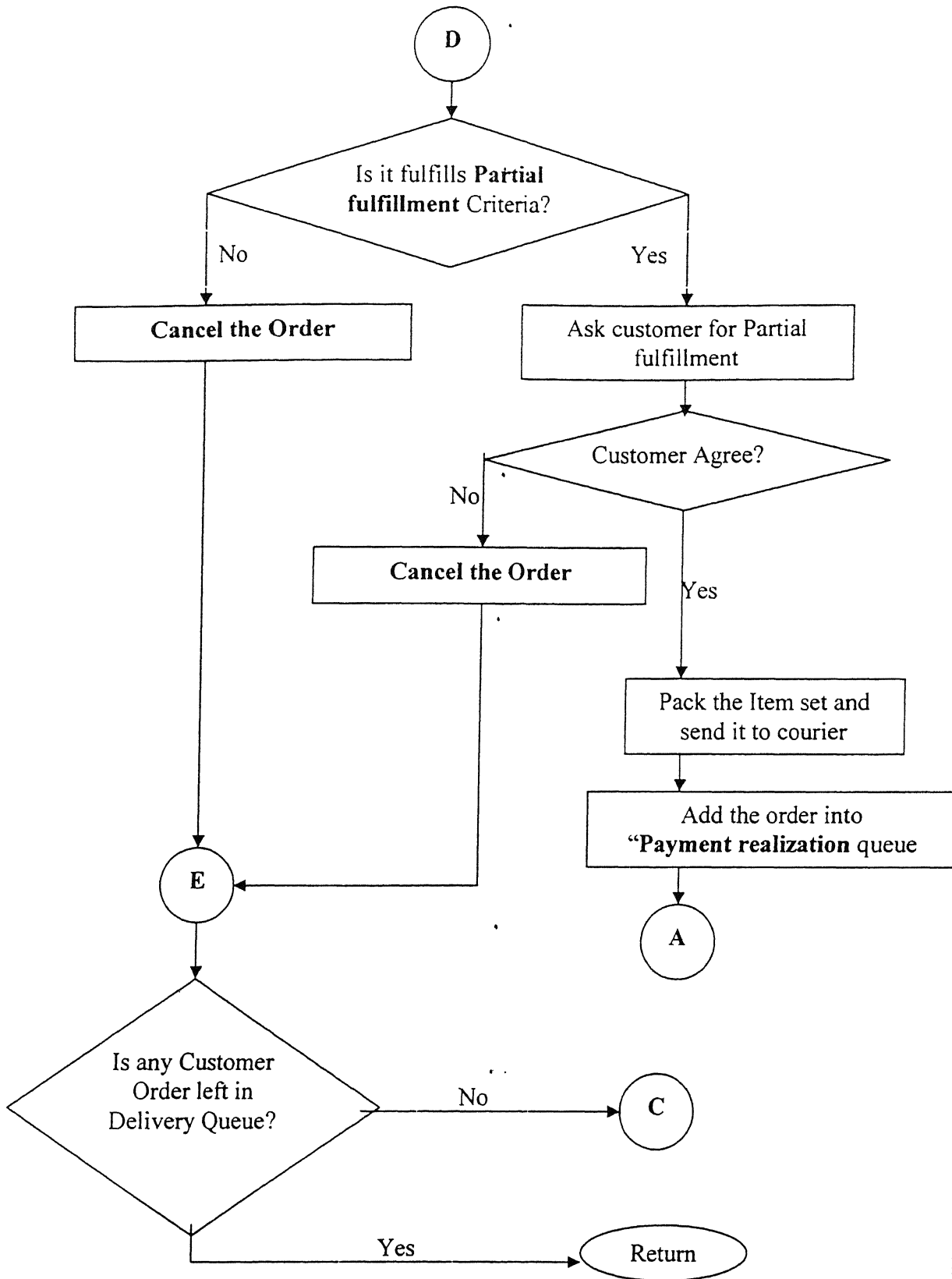
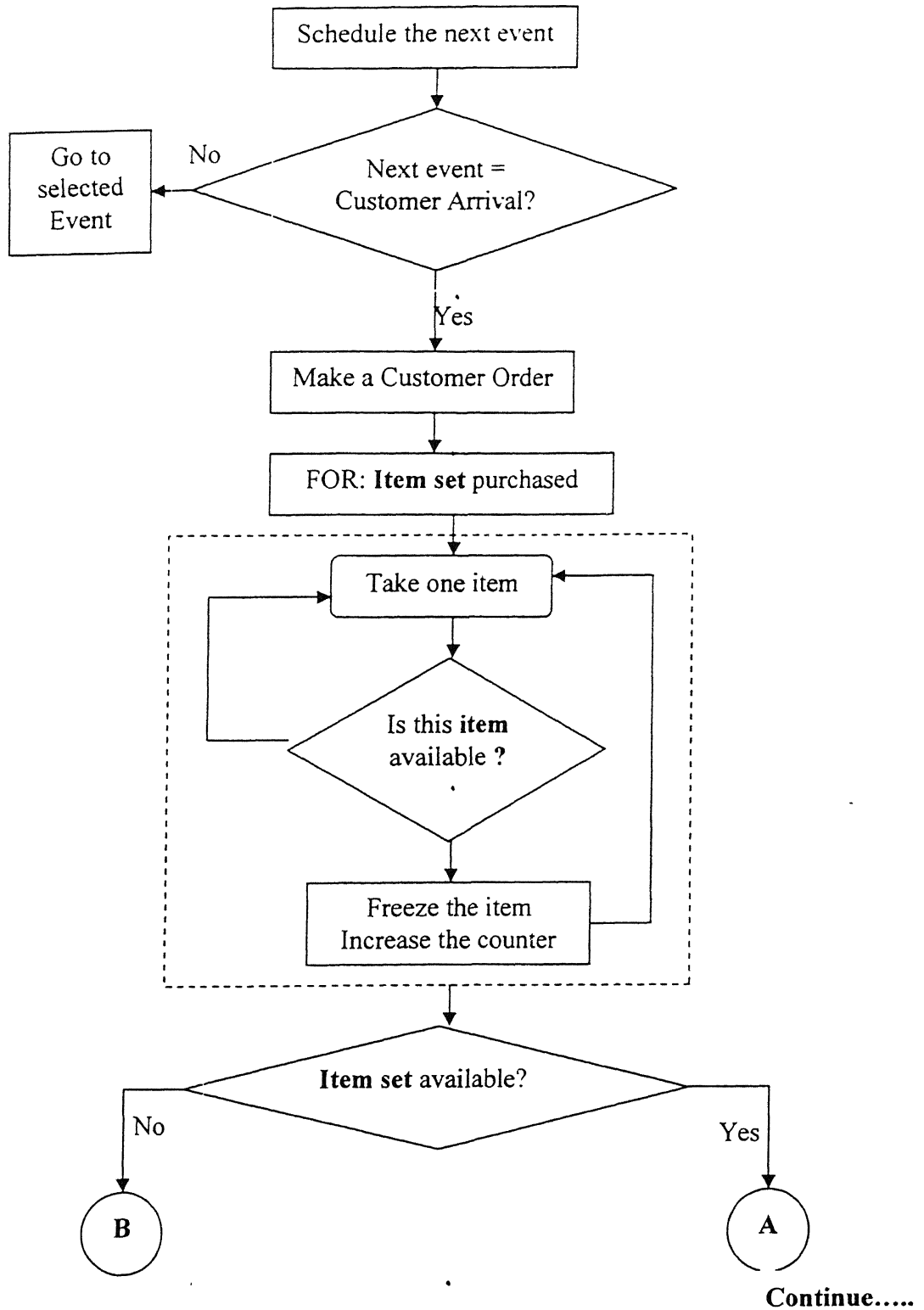


Figure 3.6.3: Customer Order fulfillment and Dispatch Online



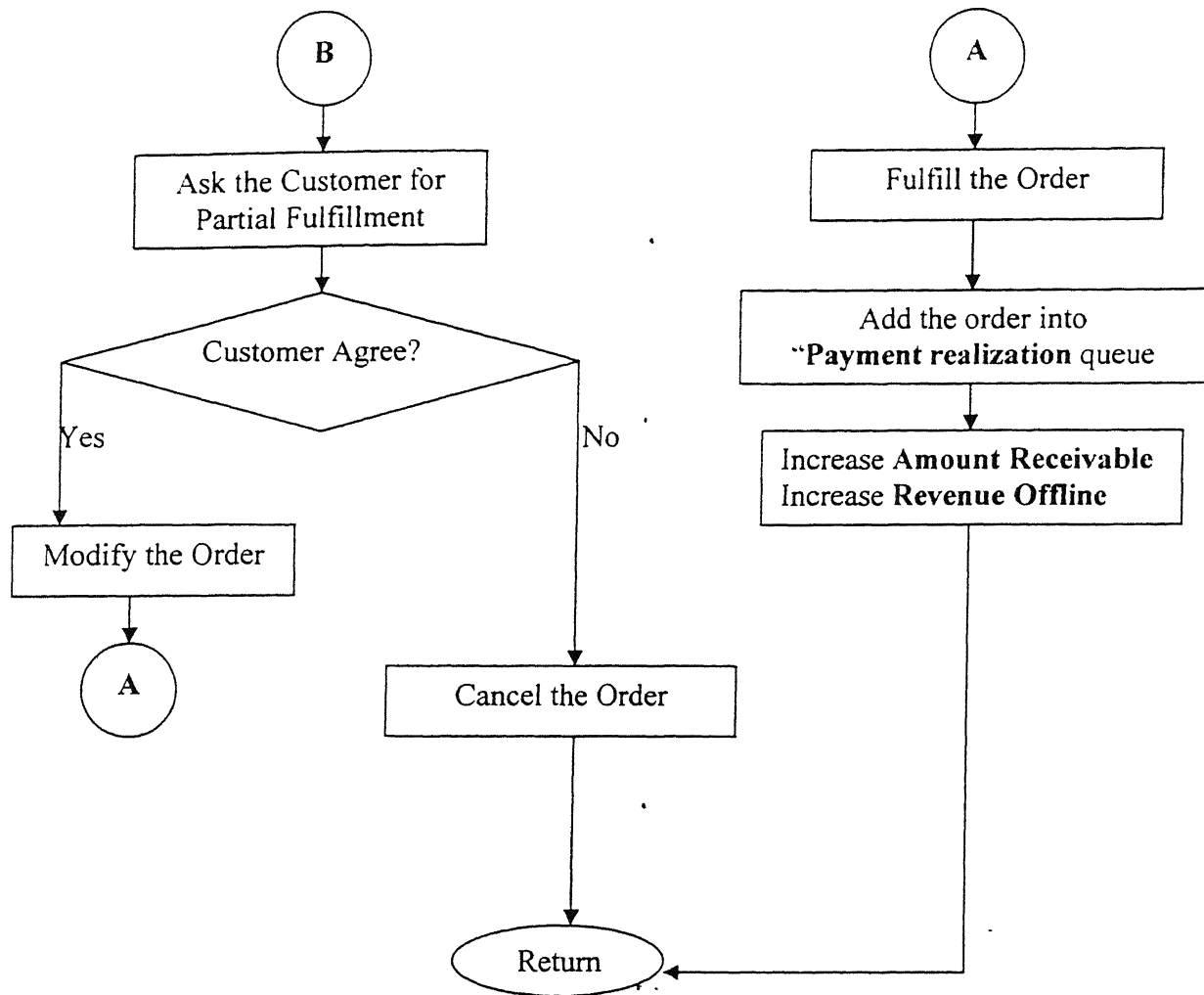
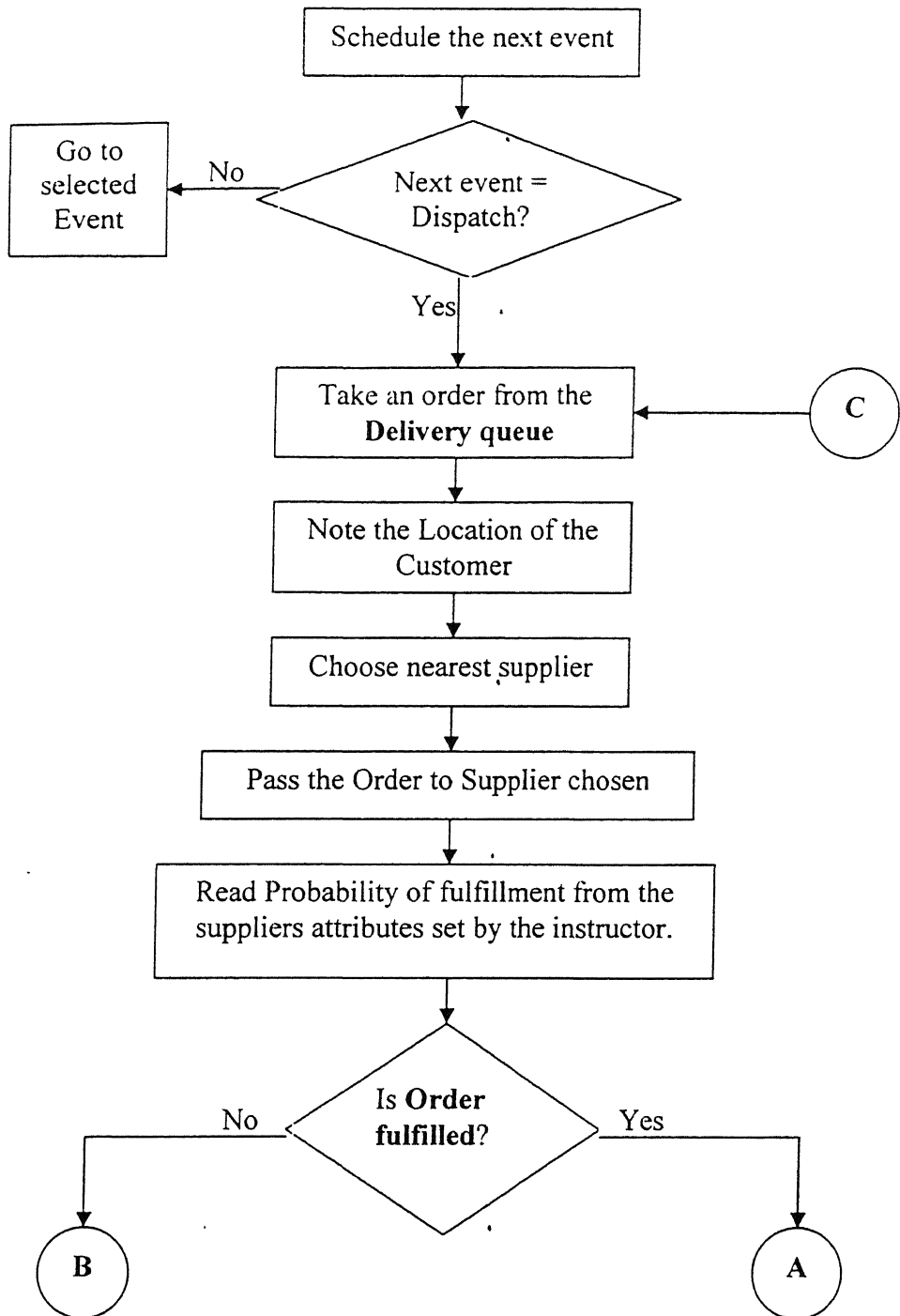


Figure 3.6.2: Customer Order Fulfillment Offline



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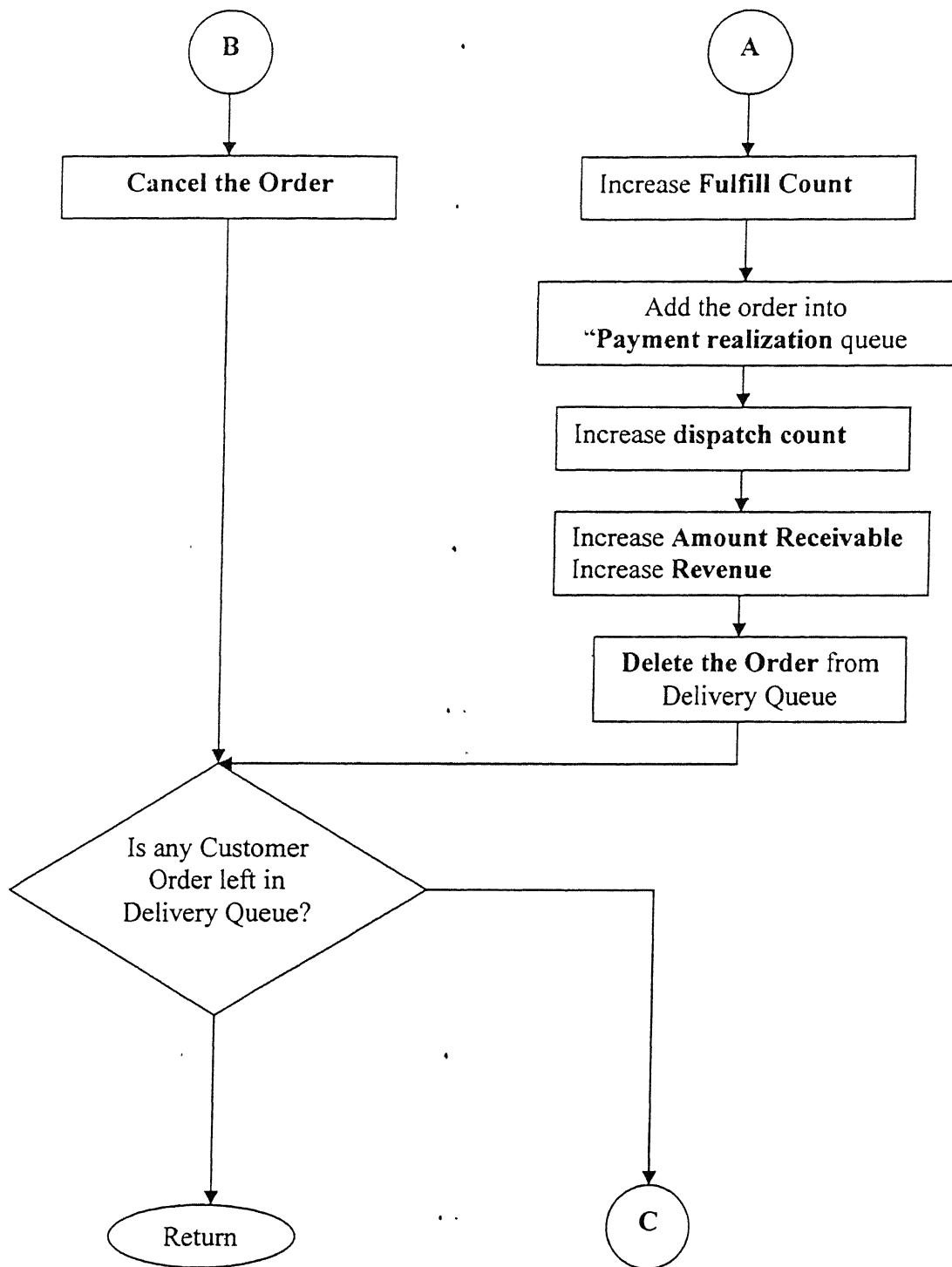


Figure 3.6.4: Dispatching of Customer Order from Supplier to Customer

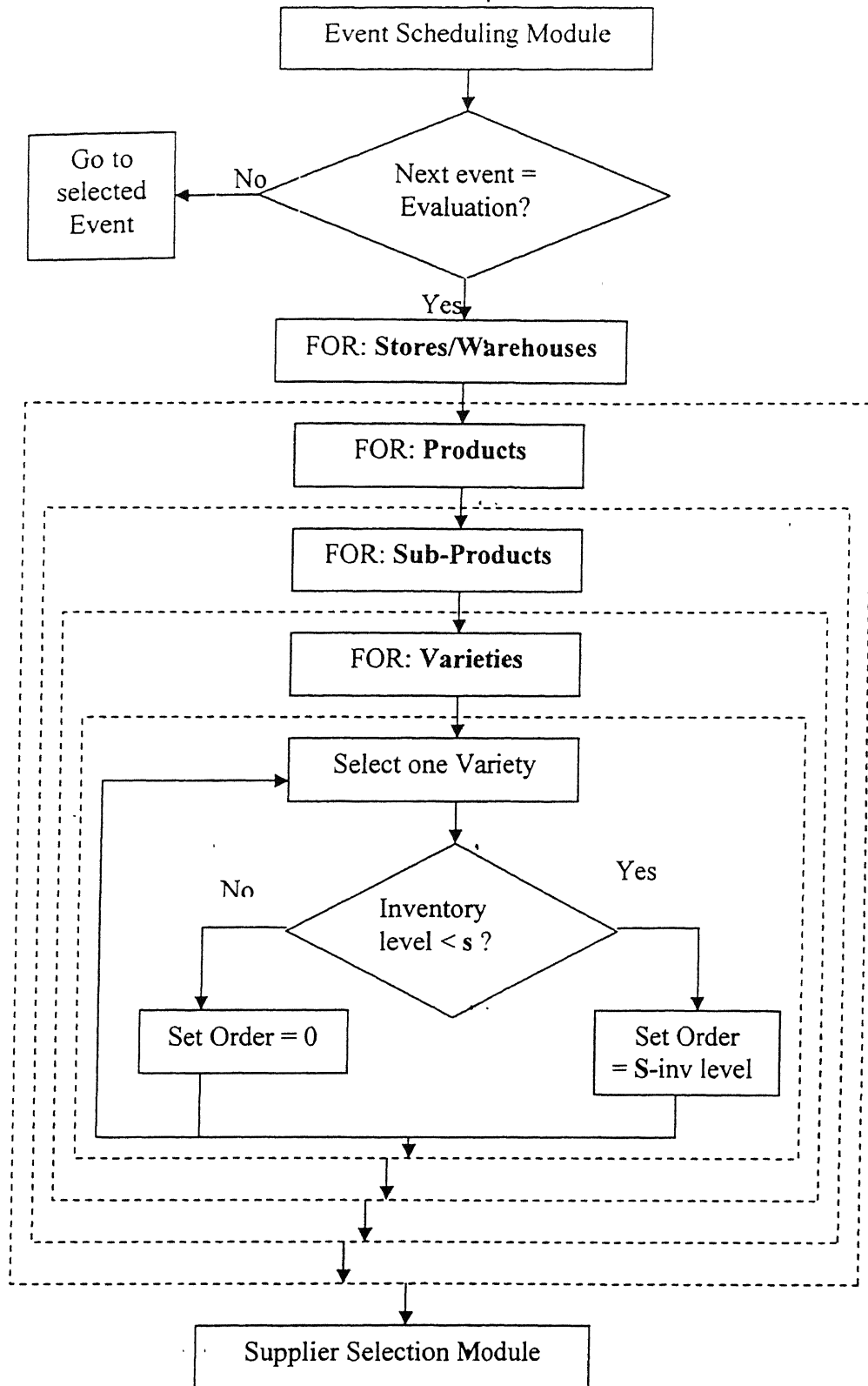


Figure 3.6.5: Inventory Evaluation

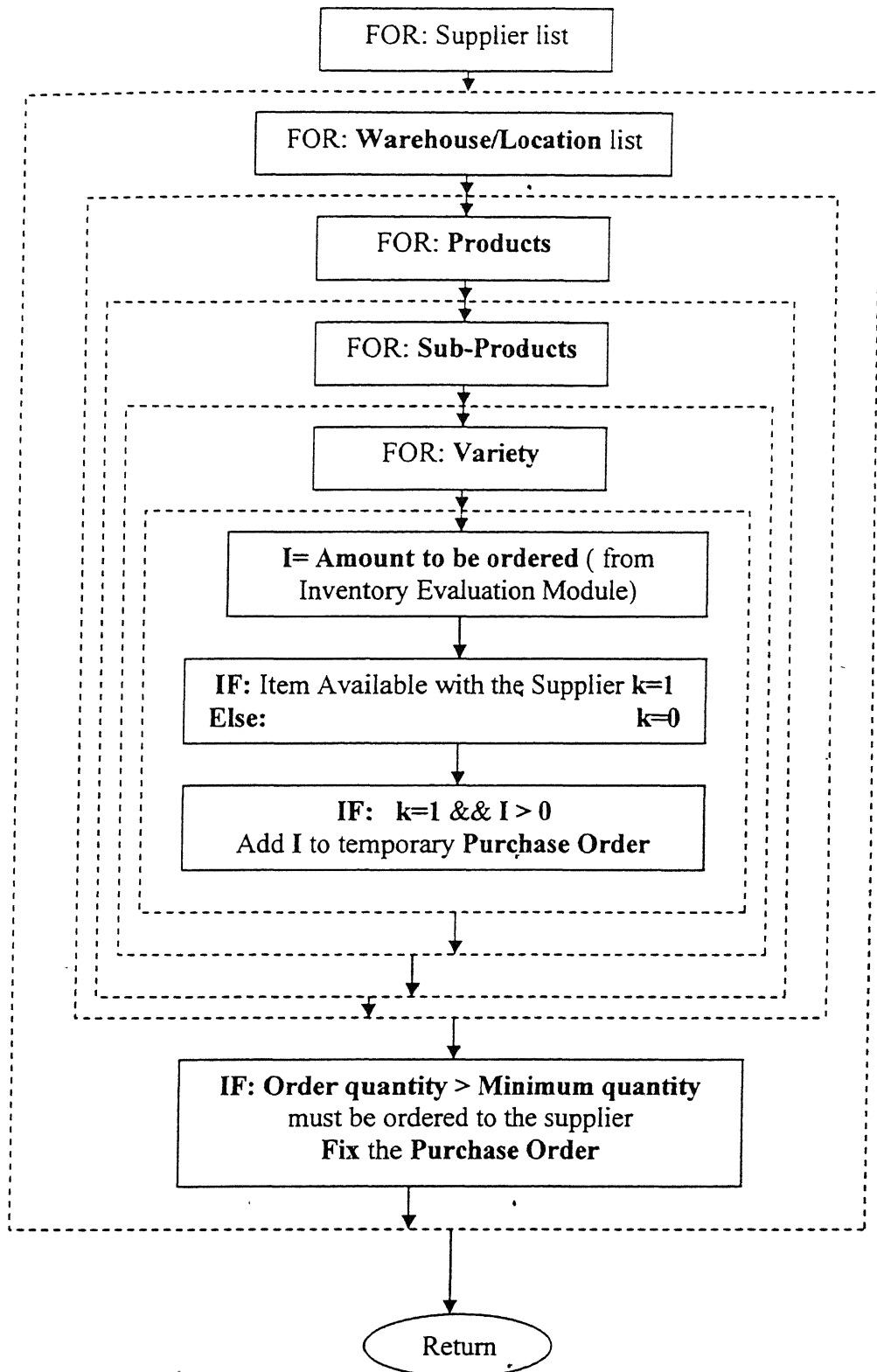


Figure 3.6.6: Supplier Selection and making a Purchase Order

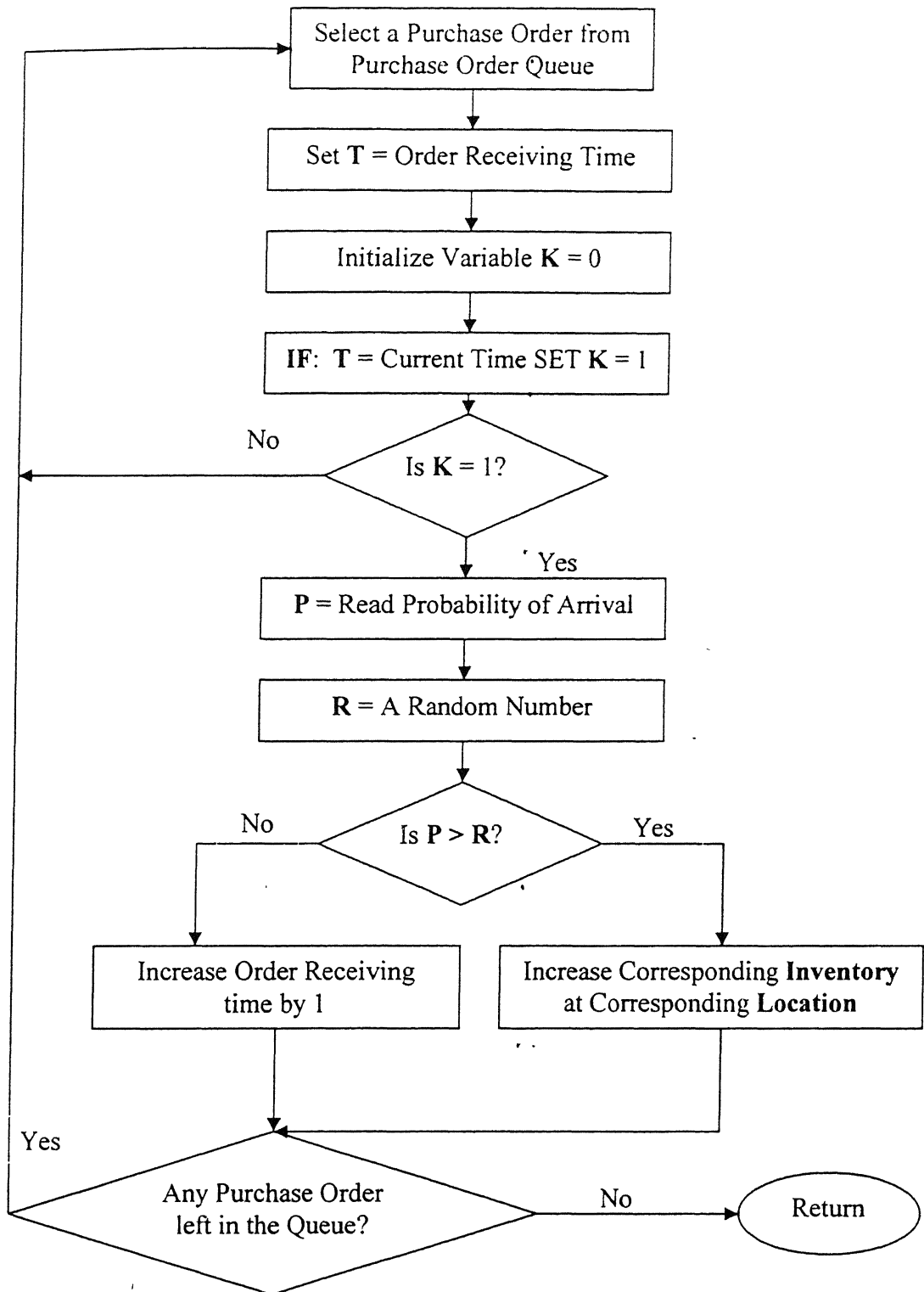
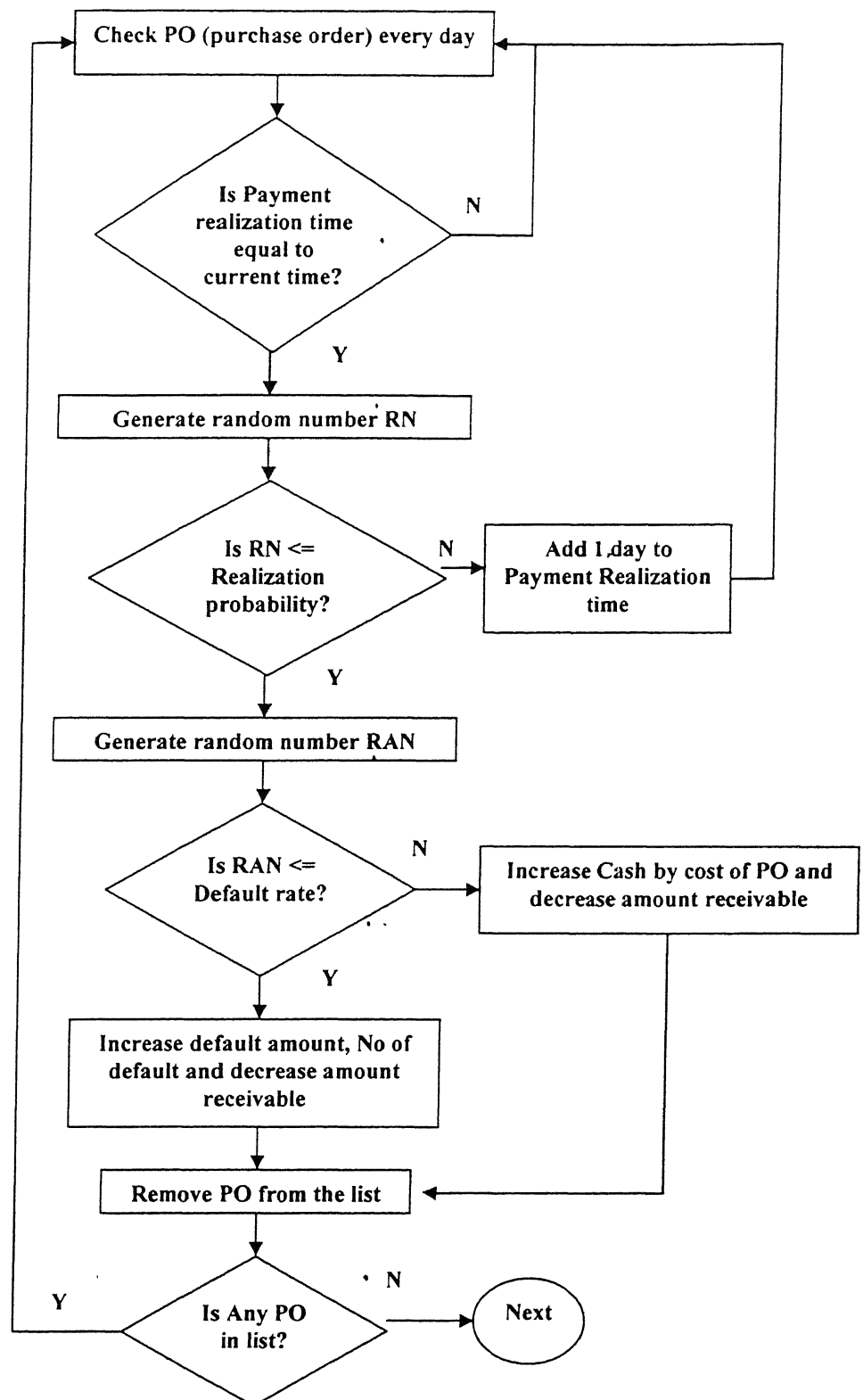
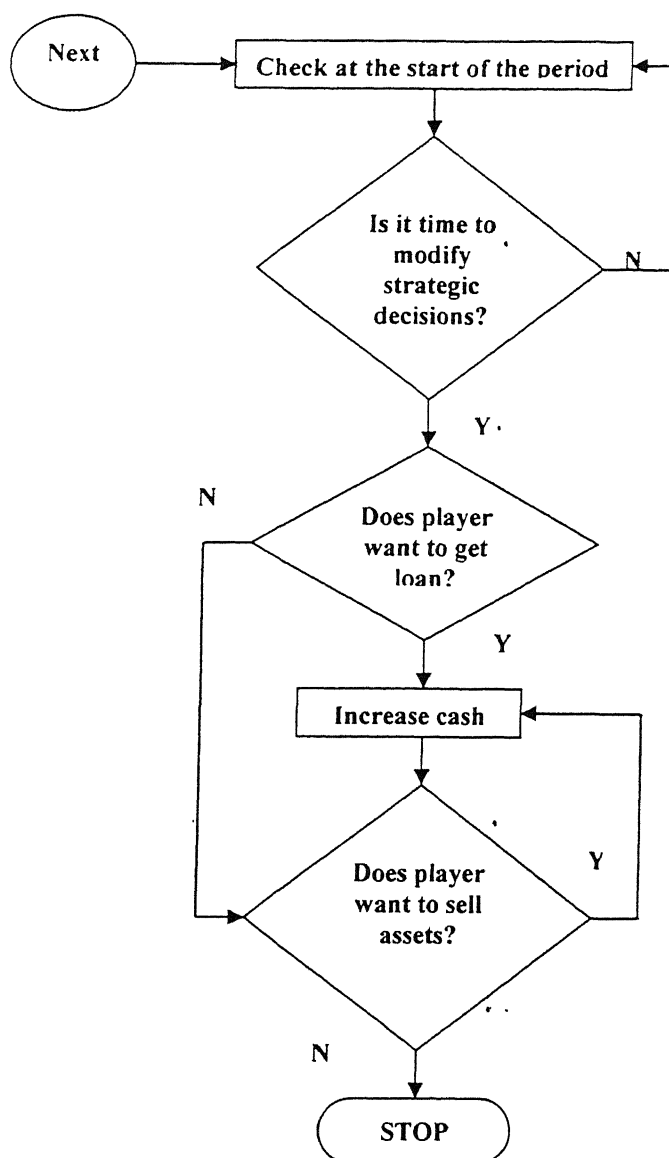


Figure 3.6.7: Goods Arrival





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**Figure 3.6.8: Cash Inflow**

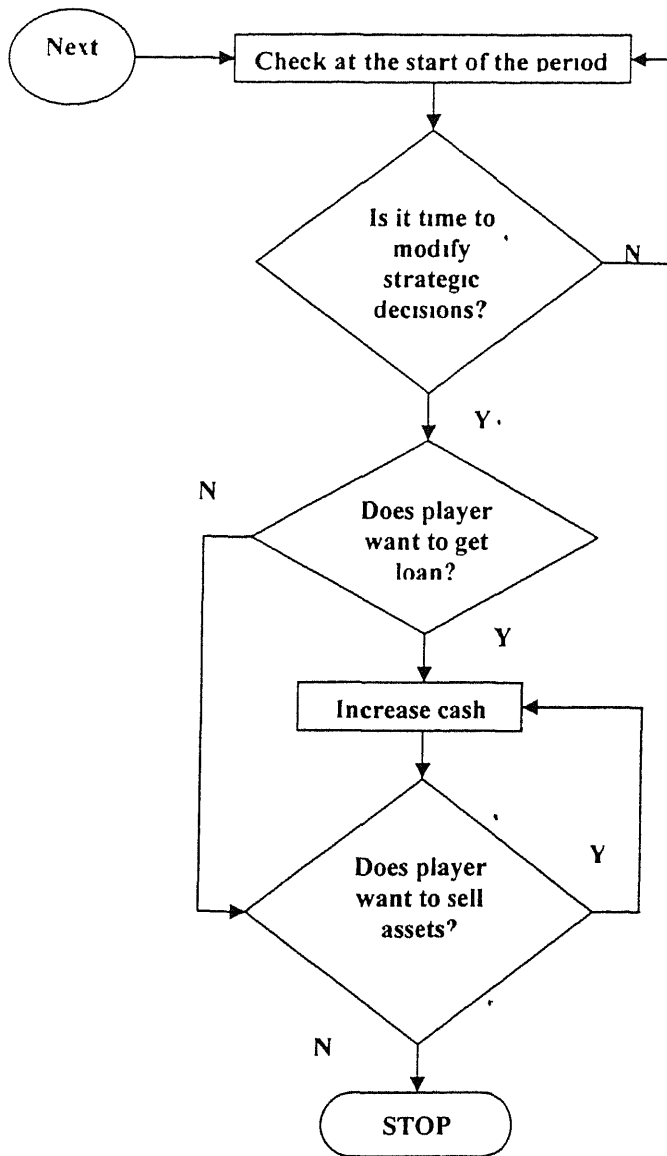
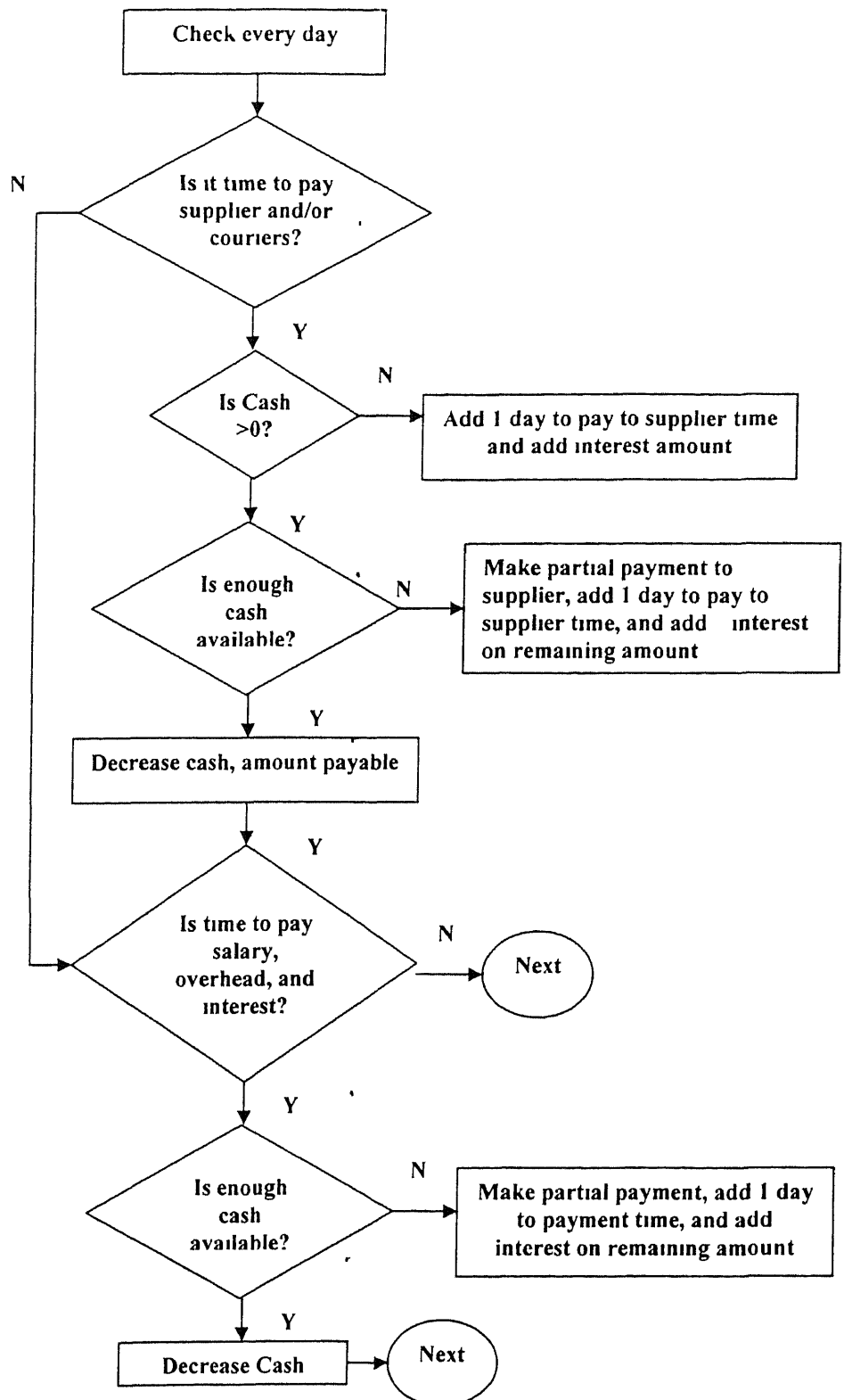


Figure 3.6.8: Cash Inflow



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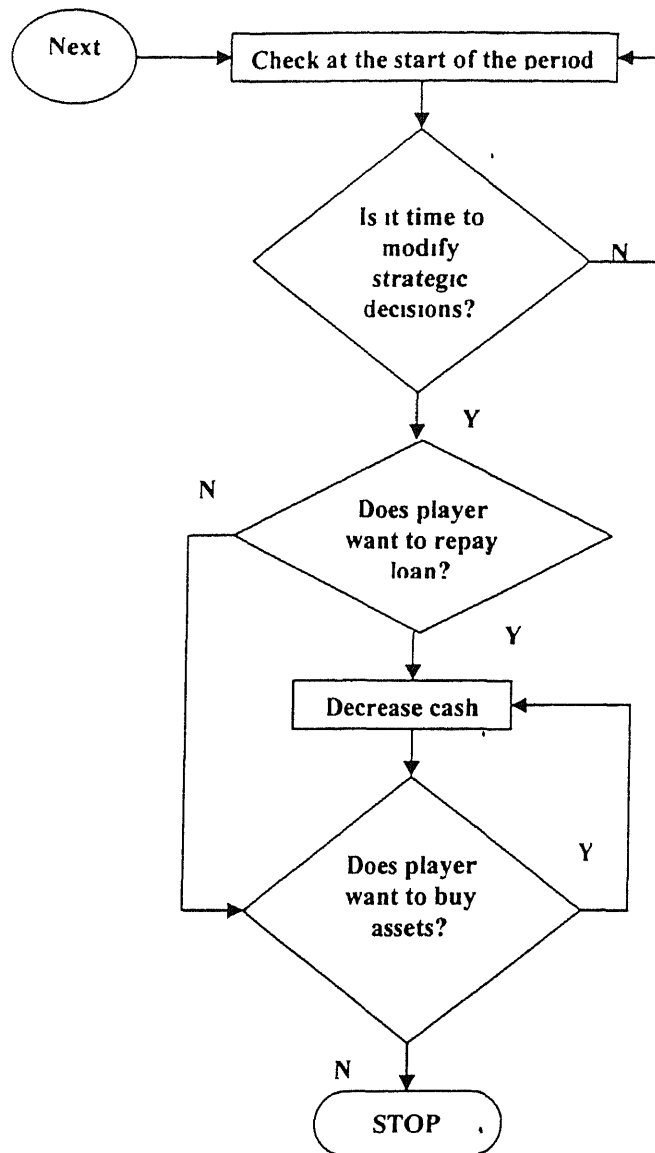


Figure 3.6.9: Cash out flow

## **Chapter-4A: Implementation of Model of First Purchase**

### **4A.1 Customer Acquisition on the web**

Today more than 2 million commercial sites operate on the web, all in fierce competition for the attention of potential buyers. E-tailers are finding that it takes enormous marketing expenditures to set themselves out from the crowd, inspire web shoppers to visit their site, and then get them to actually to make a purchase. Many e-tailors, in fact are averaging more than \$100 to acquire a new customer and some are spending upwards of \$500 (Hoffman and Novak, 2000 [26]). If a merchant is selling high margin items, or if it can be sure of a steady stream of repeat purchases, those costs may make economic sense. But for most, they are suicidal-their average customer acquisition cost is higher than the average lifetime value of their customers.

#### **4A.1.1 Developing an integrated Strategy**

An integrated advertising strategy required investing not only in online advertising such as banner ad, affiliate marketing, direct marketing which only reaches potential customers that are already online but also to spend in traditional media- targeted magazine, radio, and television ads, to reach the potential customers in the physical world as well. For any company, advertising in mass media is the most expensive and least direct way to acquire customers. But it's also the way to reach the widest possible market. One has to work out how much of it could afford to invest in the more risky gamble of traditional marketing.

Taking the example of CDNOW[26] advertising strategy, the biggest music shop online, CDNOW[26] acquires customers from seven different sources that range from the highly expensive TV, radio, and print ads, which contribute, to the very inexpensive Cosmic Music Network and word of mouth, which bring in the most customers.

Table 4A 1 Advertising Expenses of CDNOW

			Budget allocation(%)	Contributed Customers (as %of total)
	Media	Type		
expensive	Radio	off-line	16	8
	TV	off-line	16	7
	Print	off-line	16	5
	Strategic Partnerships	on-line	24	20
	On-Line Ads	on-line	24	5
Subtotal:			96%	45%
cheap	Cosmic Music			
	Network	on-line	2	15
	Public Relations	off-line	2	5
	Word of Mouth	off-line	0	30
	Free Links	off-line	0	5
Subtotal:			4%	55%
Total:			100%	100%

( Source Hoffman and Novak (HBR 2000) [20])

As given in the data above, word of mouth accounts for the lion's share of CDNOW[26]'s customers. And considering that it involves no direct costs, it's easy to see why the company views it as its most powerful source for acquiring new customers. In fact, it is in this context that the big investments in ads and partnerships make sense-as a way to fuel very lucrative word of mouth in the off-line world.

In the present game, the different channels of advertising are not modeled in the advertising response curve due to unavailability of good models in the literature; therefore a simple advertising response model is incorporated in the game described in the next section. To incorporate word of mouth effect in demand model, Kalish model is used in the game which incorporates advertising, pricing and word of mouth effect.

#### 4A.2 Advertising Response Model

The advertising response model used in developing the game is **semilog model**. It is a non competitive simple market response model function describes how two variables (e.g., sales and advertising) are related in the absence of competitive response. In a review of literature, Saunders (1987) [64] summarizes propositions about the shape of the relationship, where "effect" may be sales (or awareness or any other measure of response) and "effort" is the level of the marketing instrument.

$$Q_t = a + b \ln X_t$$

$Q_t$  = Sales or awareness at time  $t$

$a, b$  = constants.

$X_t$  = Advertising effort at time  $t$ .

The Semilog model handles the following proposition:

- 1 Even at zero level of advertising effort there will be some returns.
- 2 There are decreasing returns to scale of effort
- 3 There a level of effect that cannot be exceeded (saturation).

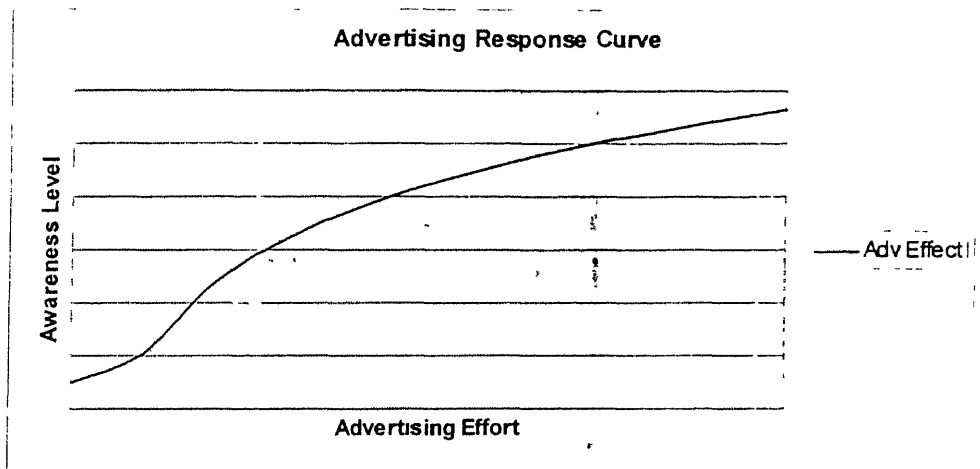


Figure 4A.1. Semilog Model

### 4A.3 Dynamic Effects in Advertising Response Curve

Response to marketing actions does not always take place immediately. The effect of an ad campaign does not end when that campaign is over; the effect, or part of it, will remain perceptible for some future time. "Carryover effects" is the general term used to describe the influence of a current marketing expenditure on sales in future period. Several types of carryover effects can be distinguished:

- **Delayed-response effect:** It arises from delays that occur between the time marketing dollars are spent and the time induced purchase occur. This type of



response is especially evident in industrial markets, and where the delay, especially for capital equipment, can be a year or more.

- **Customer-holdover effect:** It arises from new customers created by the marketing expenditures, who remain customers for many subsequent periods. Their later purchases should be credited to some extent to the earlier expenditures. Some percentage of the new customers will be retained each period, this situation gives rise to the notion of the customer retention rate and its converse, the customer decay rate (also called attrition rate or erosion rate).
- **Hysteresis:** It is the asymmetry in sales buildup compared to sales decline. For example, sales may rise quickly when an advertising program begins and then remain the same or decline slowly when the program is completed.
- **New Trier Effects:** In this case sales reach a peak before settling down to steady state, this effect is common for frequently purchased products, where many customers try the product but only a few become regular users.
- **Stocking effects:** After a deal or sales promotion occurs when the promotion not only attracts new customers but also encourages existing customers to “stockup” or “buyahead”. The stocking effect often leads to a sales “trough” in the period following the promotion.

#### **4A.3.1 Modeling Dynamic Effects: Discrete Time Model**

To incorporate dynamic effects in the advertising response curve, a linear dynamic model involving a single marketing variable is used. The activity  $X$  and the response variable  $Q$  will be subscripted by the discrete-time interval  $t$ . Conceptually, the problem we face is the following:  $Q_t$  will be affected not only by  $X_t$  but by  $X_{t-1}$ ,  $X_{t-2}$  and so on.

The equation for  $Q_t$  can be written as follows:

$$Q_t = a_0 + a_1 X_t + a_2 X_{t-1} + a_3 X_{t-2} + \dots \quad (1)$$

Due to a variety of data and estimation problems, most models posit some relationship among the  $a_i$ 's. The most common one develops as follows: assume that the effect of  $\{X_t\}$  on  $Q_t$  decays with time in a consistent way— that is, it loses a constant proportion of its influence each time period. This assumption is equivalent to

$$\frac{a_{t+1}}{a_t} = \lambda, \quad \text{for all } t \quad (2)$$

or,

$$\frac{a_2}{a_1} = \lambda,$$

$$\frac{a_3}{a_1} = \frac{a_2}{a_1} \frac{a_3}{a_2} = \lambda * \lambda = \lambda^2$$

in general,

$$\frac{a_t}{a_1} = \lambda^{t-1} \quad \text{or} \quad a_t = a_1 \lambda^{t-1} \quad (3)$$

Now equation can be written as

$$Q_t = a_0 + a_1 X_t + a_1 \lambda X_{t-1} + a_1 \lambda^2 X_{t-2} + \dots \quad (4)$$

But the equation still depends on the whole history,  $X_t, X_{t-1}, \dots$  so our truncation problem still is with us. This problem can be solved by lagging equation one period and multiplying it by  $\lambda$

$$\lambda Q_{t-1} = \lambda a_0 + \lambda a_1 X_{t-1} + \lambda^2 a_1 X_{t-2} + \dots \quad (5)$$

Subtracting 5 from 4

$$Q_t - \lambda Q_{t-1} = a_0 (1 - \lambda) + a_1 X_t \quad (6)$$

or

$$Q_t = a^* + \lambda Q_{t-1} + a_1 X_t \quad (7)$$

where  $a^* = a_0 (1 - \lambda)$

This procedure, attributed to Koyck (1954), is often referred to as the Koyck Transformation. Estimation problems are now greatly reduced, with but three parameters and two variables.

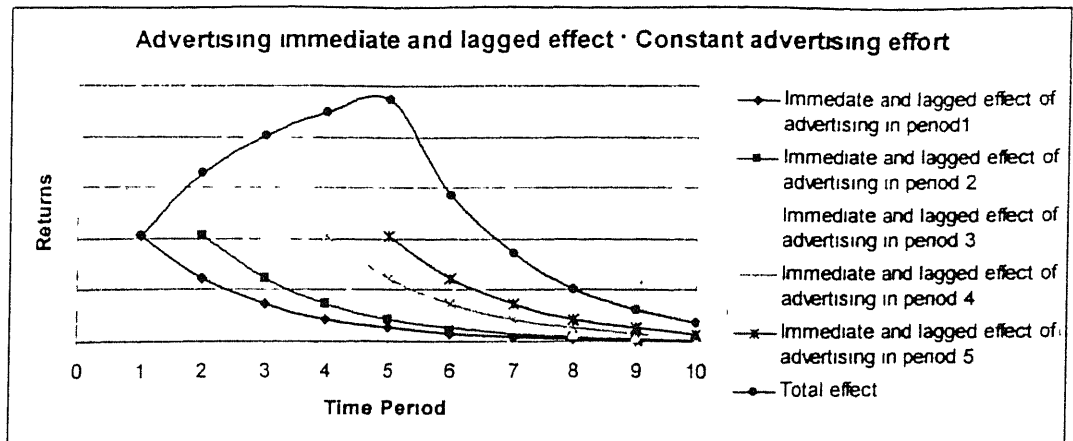


Figure 4A 2. Carryover effect of Advertising

#### 4A.4 Kalish (1985) [30] Model

This model incorporates pricing and advertising in the diffusion model, the two most frequently studied variables. Instead of one stage adoption process assumed by Bass in his model, Kalish assumes a two stage model, where the rate of adoption is determined by.

1. Awareness (information) diffusion, controlled by advertising and word of mouth
2. Adoption within a (growing) potential adopter population, whose size depends on awareness, price, and uncertainty concerning product performance.

The framework that was suggested in this model is that awareness information spreads in an epidemic-like manner, and the actual adoption depends on price and the individual's valuation of the product. However the experience type information is only produced by actual adopters. This type of information will be released by adopters, as they use the product, and is spread by word of mouth, publicity, and sometimes reinforced by advertising. This type of information reduces the uncertainty associated with the new product. The population is heterogeneous with respect to their valuation of the product due to income and taste differences. They also discount the value of the product due to the uncertainty associated with it as a result of lack of information. As experience

information becomes available, the uncertainty associated with the new product is reduced, and accordingly the product's value increases

The rate of adoption is therefore determined by awareness diffusion, which is controlled by advertising, and the rate of growth of the potential adopter population, which is controlled by price

The formulization of the ideas and implementation is explained in details below:

#### **4A.4.1 Market Potential**

Different customers will value the new product differently due to income and taste differences in the consumer market and that a consumer will buy if the price of the product is less than its value to him (i.e. less than the reservation or reference price). He also assumes that individuals are risk-averse, and that, therefore, the more experience the market has with a product, the less uncertain the valuation of the product to the population and hence, the greater the market potential

A simple way to incorporate this is as follows:

$$N(p) = N(t) * F(p)$$

Where,

$N(p)$  = Potential population

$N(t)$  = Population size over time.

$F(p)$  = proportion that finds price acceptable

#### **Calculation for $N(t)$ :**

At the start of the game, the instructor sets the total population size for online music retailing of CD's and Cassette's and the growth rate of the population. By default the population size is assumed to be 10 million and the growth rate is assumed to be 15%, the rate with which the Indian music industry is growing (source: IMI, Indian Music Industry)[28]. The population at time  $t$  is calculated by multiplying the growth rate with the population at time  $t-1$

$$N(t) = r * N(t-1)$$

Where,  $r$  = growth rate

**Calculation for  $F(p)$ :**

The proportional acceptance is calculated by the pricing policy of the player for the different items offered separately for CD's and Cassette's. The instructor sets the reference price (a price that the consumer pays most frequently, paid last or pays, on average, for goods in this category) of CD and Cassette and that price is available to the player for deciding his pricing policy. The instructor also sets the proportional acceptance at reference price. As the player increase or decrease its prices there will be a change in the proportional acceptance.

Pricing is one of the most important elements of the marketing mix. It is the only marketing variable that directly determines revenue. In addition, because price affects quantity sold, it affects costs as well. Thus, few marketing decisions within a firm have more critical consequences than of pricing decisions.

A number of factors must be taken into account in pricing decisions

- 1A.1 The objective of the firm
- 2A.1 Consumer's willingness to pay for the product.
- 3A.1 The costs of procuring and marketing the product
- 4A.1 Competition.

The player decides the prices of each item in CD and Cassette, and then the average price of CD and Cassette is calculated. If an average price of particular type of product is lower than the reference price of the product then the proportional acceptance increases, but there are decreasing returns to efforts

$$\overline{MRP}_{CD} = \frac{\sum_{\text{subproduct}} \sum_{\text{item}} MRP_{CD}}{\text{Total No of items}}$$

$$\overline{MRP}_{Cass} = \frac{\sum_{\text{subproduct}} \sum_{\text{item}} MRP_{Cass}}{\text{Total No of items}}$$

After calculating the mean MRP of CD's and Cassette s, it is compared with the  $RP_{CD}$  and  $RP_{Cass}$ . If MRP is equal to the corresponding reference price then the proportional acceptance at reference price fixed by the instructor is returned otherwise the logarithmic function is used to determine the proportional acceptance.

The function works as follows

$$\text{if } \overline{MRP}_{CD} == RP_{CD}$$

$$\text{then } PA_{CD} = \overline{PA}_{CD}$$

$$\text{else if } \overline{MRP}_{CD} > RP_{CD}$$

$$\text{then } PA_{CD} = \overline{PA}_{CD} (1 + a \ln(\overline{MRP}_{CD} - RP_{CD}))$$

$$\text{else if } \overline{MRP}_{CD} < RP_{CD}$$

$$\text{then } PA_{CD} = \overline{PA}_{CD} (1 - a \ln(RP_{CD} - \overline{MRP}_{CD}))$$

Where,

$RP_{CD}$  = Reference price of CD entered by the instructor.

$\overline{PA}_{CD}$  = Proportional acceptance at price set by the player

$PA_{CD}$  = Proportional acceptance at reference price entered by the instructor.

$a$  = constant.

Assumption CD Ref Price (RP) =300 Rs and and PA at RP = 0.7

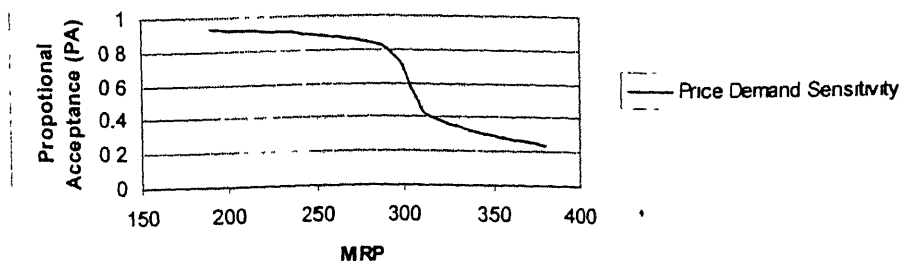


Figure 4A.3: Relationship between PA and Price

#### 4A.4 2 Awareness Diffusion

Kalish assumes that information diffusion is homogenous (geographically as well as by population segments) Unaware individuals can become aware by word of mouth, or by advertising Thus the conditional likelihood of becoming aware is proportional to the number of “transmitters” and to the advertising effectiveness The assumption is that actual adopters transmit information more effectively than just informed individuals, with contact rates  $b$  and  $b''$  respectively, then the awareness diffusion equation is

$$\frac{dI(t)}{dt} = (1 - I) \left\{ f(A(t)) + b \left[ I - \frac{X}{N_0} \right] + b'' [X / N_0] \right\}$$

Where,

$I$  = proportion of population aware at  $t$

$X$  = numbers of adopters at  $t$

$N_0$  = potential population

$A(t)$  = advertising spending rate

$f(\cdot)$  = impact of advertising on unaware population

$b$  = impact (contact rate) of those aware but who have not adopted on the unaware population.

$b''$  = impact (contact rate) of those have already adopted on the unaware population.

In this model  $f(A(t))$  is substituted by the discrete time advertising model described above:

$$Q_t = a^* + \lambda Q_{t-1} + a_1 A_t$$

Therefore, the final equation becomes:

$$\frac{dI(t)}{dt} = (1 - I) \left\{ a^* + \lambda Q_{t-1} + a_1 A_t + b \left[ I - \frac{X}{N_0} \right] + b'' [X / N_0] \right\}$$

This equation is used in the game to calculate the awareness level at time  $t$  which is affected by the advertising effort ( $A_t$ ) by the player at time  $t$  as well as word of mouth or imitation effect

#### 4A.4.2 Dynamics of Adoption

Kalish assumes that the expected value of performance is an unbiased predictor of the actual product performance. Once the product is introduced, its performance could be better or worse than expected, which will change its value. Customers that find price below their risk adjusted price and that are aware of the new product, are the potential adopters.

The total number of potential adopters at time  $t$  is the percentage that are aware, multiplied by the individuals that find the adjusted price acceptable:  $N(p) * I$ .

Assuming that all past adopters would still adopt given current prices and uncertainty, then the net potential is the difference between the total potential and the number who are already adopters. The aggregate adoption equation is then:

$$\frac{dX}{dt} = k \{N(p) * I - X\}$$

where,  $k$  = rate of adoption (which could be a function of advertising, product quality etc)

This equation is used to calculate the number of adopters of the site. The adoption rate calculated by making it a function of

$$k = f(\text{site design, product range offered})$$

A site design index is calculated by the features that a player is offering on his/her site and the product range index is calculated by the number of varieties a player is offering on the site, some weightage are given by the instructor to each index and then the adoption rate is calculated.

#### 4A.4.3 Modeling New Customers arrival Rate

After calculating the cumulative number of adopters in time period  $t$ , total number of new customers are calculated by:

$$T_t = r * (\alpha * X_t - \bar{T}_{t-1})$$

Where,  $T_t$  = triers in time period  $t$ .



$X_t$  = cumulative number of adopters in time period t

$\bar{T}_{t-1}$  = Cumulative number of triers in time period t-1.

$\alpha$  = percentage of cumulative adopters arrived at the site in time period t

$r$  = conversion rate.

The conversion rate is calculated by making it a function of

$$r = f(\text{Promotion, Product Range, Delivery Policy})$$

Promotion index is calculated by the amount of promotion a player is offering and on how many items, product range index is calculated as described above, and the delivery policy index is calculated by the price player is charging with respect to the reference price of the delivery. Certain weightage are assigned by the instructor for each index denoting how much each impact on the conversion rate

#### **4A.5 Modeling Repeat Customers arrival Rate**

For calculating the arrival rates of old customers, the model developed by Fader and Hardie (2000) [16] is used. They modeled weekly sales of a online music store CDNOW using a finite mixture of beta-geometric distributions with a separate time-varying component to capture nonstationarity in repeat buying. This model is used to model the quantity or the number of units that a customer will purchase and to calculate the arrival rate of repeat customers. The description and implementation of this model is given in part-2 of this thesis.

#### **4A.6 Customer Attrition Rate**

It is also called disenrollment, churn, dissatisfaction, or the opposite of loyalty rate or retention rate, it all comes down to one concept - lost customers equal lost revenues! If customer attrition rate is too high, that means customers are not satisfied with product or service that one is offering. It is a function of advertising effectiveness and customer service level. Advertising effectiveness signifies the competitiveness in the market, i.e. if competitors are aggressive in advertising their products, and if firm's customer service level is low then chances of losing customers will be high i.e. attrition rate will be high

## Chapter 4B: Implementation of Repeat Purchase Model and Product Probability

To acquire a customer on a web is a challenging task and convert this customer in to buyer is more challenging for any e-tailor because of fierce competition. As relatively low switching cost, it is becoming difficult to prevent existing customers to switch over for any online retailer. Until and unless, there is some incentive to purchase from the same online retailer, customer switching probability is low. To convert customer into buyer and prevent existing customers to switch over, promotion and product assortments play important roles. The latest example of promotion, "Online music retailer CDNOW and Pizza Hut Friday joined for a promotion that gives buyers of a New Yorker pizza a free custom CD" (Source: <http://www.internetnews.com>)

Because of negligible menu cost, many online retailers are using different promotion strategy for repeat customers and new customers, and some of them are succeeding. Some studies (Ernst and Young's study on "*Global Online Retailing*", 2001) [68] have found that customer satisfaction and delivery have significant impacts on purchase. In this part, we have explained effects of promotion, product assortments, customer satisfaction level, and delivery policy to purchase probability and purchase quantity.

### 4B.1 Impact of Promotions

There has been relatively little theory-building thus far on e-promotions (Vijay Mahajan et al. 2000) [42]. They speculate two reasons. First, as suggested by Degeratu et al. (2000) [12], online promotions are perhaps less appealing than that in-store promotion as it is almost impossible to replicate the punch of in-store, visual, point-of-purchase promotional activity in online settings. Second, most of the online promotional activity is price based and is perhaps subsumed in pricing models.

Shun Yin Lam et al. (2001) [36] have studied impacts of Promotion in terms of sales (item quantity and dollar value) for physical store. We have used their findings in the model for the Purchase Probability (discussed latter in this chapter) because of no model is available for the Online promotions. Though, they have developed model for physical store, their findings are applicable to Online.store also.

## 4B.2 Shun Yin Lam's model (2001) [36]

Retailer's marketing activities are designed with the objectives of drawing consumers in to their stores, encouraging shoppers to make purchase, and influencing the types and quantities of items that consumers buy. Three objectives can be classified into three broad categories: *attraction effects* that focus on consumer's store entry or store choice decision (in our case read Store as Online Retail Store), *conversion effects* that relate to consumer's decisions about whether or not to buy something at store they are visiting, and *spending effects* that represents both the size (dollar value and units sold) and composition of their transactions (Dhebar et al [14], 1987, Mulhern [48], Kotler 1999[34]).

### 4B.2.1 An Expanded store Performance Framework

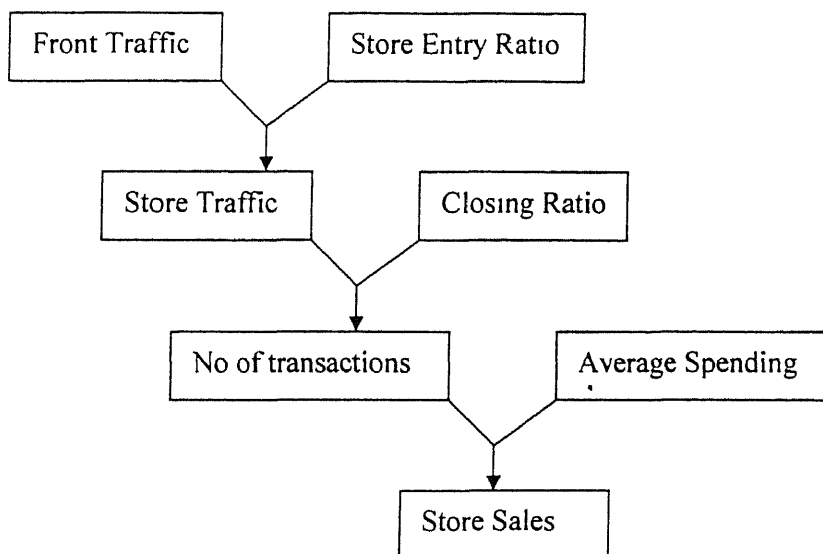


Figure 4B 1 an Expanded Framework for Analyzing Store Performance

Few researchers have analyzed the attraction effects of retail marketing activities. Studies in this area have compared the attraction effects of different marketing activities by using the number of transactions completed as the store traffic measures (Walters and Rinne 1986[74], Walters 1988[74], Mulhern and Leone 1990[48]).

Attraction influences by breaking store traffic down into two components. front traffic and store entry ratio. This decomposition allows a distinction between different marketing activities in their attraction effects, and a more precise estimation of those attraction effects. Some retail marketing activities, such as newspaper advertising,

may bring shoppers to a store, (for online store, we can say first time visitors on website) thus increasing both front traffic and the store entry ratio. Other activities, such as store front signage and display (for online store, aesthetics of website), may only have an effect of drawing people from front traffic into a store- that is (visitor click on other web pages of web site), changing the store entry ratio without significantly influencing front traffic. Furthermore, compared to front traffic and store traffic, the store entry ratio may be less affected by seasonal factors, and hence be a better criterion variable for the measurement of attraction effects.

The closing ratio is related to the effectiveness of retailer's activities in the converting shoppers to buyers. Use of a closing ratio to assess performance is an accepted practice among retailers (Robins 1994)[60]. No empirical research to date has studied conversion effects at the store level, although several studies have investigated these effects at the product category or item level (e.g., Yalch 1993[81], Wansink 1998[75]).

Numerous studies have investigated various spending effects on retail marketing activities, including the effects on sales and purchase quantities per transaction, and unit sales of substitute and complementary items (Mulhern and Leone 1991[48], Wansink 1998[75]). He employed average spending (per transaction) to assess the spending effects of marketing activities at the overall store level. This measure can be expanded to analyze the spending effects at item or category levels depending on data availability. Average spending can be expressed in dollar or unit terms, and is related to the composition of individual transactions completed at a store. Average purchase more products, or purchase products that have higher prices. Average unit spending will increase only when individual buyers purchase more items.

#### **4B.2.2 Factors Influencing Store Performance**

A significant body of literature provides the theoretical argument and some empirical support for the effects of various controllable and uncontrollable variables on front traffic, store entry ratio, and average spending (e.g., Mulhern and Leone 1990[48]). Figure 4.2 summarizes these variables at a general level and provides an organizing framework for studying multiple impacts of these variables on store performance.

These variables may affect the four sales components differently. For example, our store activities (e.g.: newspaper advertising- search engine listing for Online store)

would mainly affect front traffic and store entry ratio, whereas in store activities such as the behavior of sales person and store atmospherics (website features for online store) would mainly affect the closing ratio and average spending. The effects of these variables can be explained by economic and psychological theories.

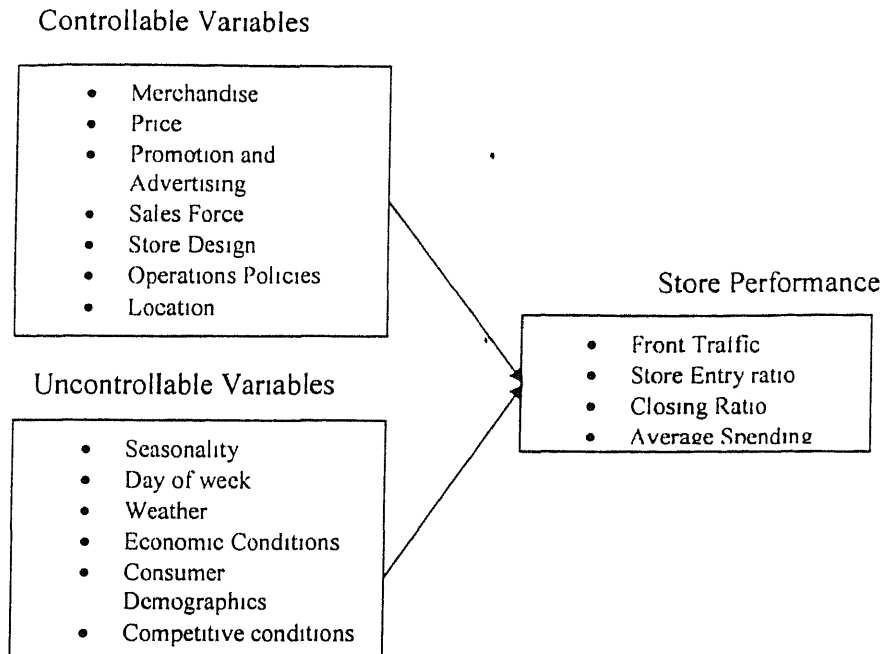


Figure 4B 2 Factors Influencing Store Performance

#### 4B.2.3 Price Promotion

Shun Yin Lam et al. (2001) [36] have done empirical study to find out relationship between purchase quantity and price promotion. They found that for most of products, price promotion increase average unit spending.

#### 4B.3 Peter Fader Model (2001) [16]

We have used Fader et al. (Interface, May-June 2001) [16] model to find out purchase probability with number of items for New Customer and Repeat Customer. Fader and Hardie [16] have developed this model for CDNOW com, one of the top music online retailer in world

##### 4B.3.1 Why this model?

There are two reasons to use this model. First one is no other model is available to forecast repeat purchase for online business. Second reason is CDNOW com. CDNOW is one of the oldest and largest online retailer, having sold different forms of music on the Web since 1994. It carries approximately 500,000 different albums –

about 10 times as many as typical bricks-and-mortar mega store-and it reports store traffic over 200,00 visitors per day During first five years of operations, CDNOW attracted over 700,000 unique customers who made purchases at the web site

This model can be used to forecast the future purchasing of the customers The main input requires for this model are incremental tries (First time purchaser).

#### **4B.3.2 Model Description**

Let the random variable  $T_w$  denote the number of units purchased in week  $w$  by a customer whose trial purchase occurs in week  $w$  (Note that, by definition,  $T_w$  is a zero-truncated discrete random variable.) Our submodel for the distribution of  $T_w$  is based on the following two assumptions

(1) At the level of the individual customer,  $T_w$  is distributed according to a shifted geometric

distribution with parameter  $q_T$  and probability mass function

$$\begin{aligned} P(T_w = x / q_T) \\ &= q_T (1 - q_T)^{x-1}, & x = 1, 2, \dots; 0 < q_T < 1, \\ &= 0, & x = 0; \end{aligned}$$

(2)  $q_T$  is distributed across the population according to a beta distribution with parameters

$\alpha_T$  and  $\beta_T$ , and probability distribution function

$$g(q_T) = \frac{1}{B(\alpha_T, \beta_T)} q_T^{\alpha_T - 1} (1 - q_T)^{\beta_T - 1} \quad (1)$$

$$0 < q_T < 1, \quad \alpha_T, \beta_T > 0,$$

The intuition associated with these two assumptions is as follows. The geometric distribution

corresponds to purchasing following a coin-flipping process in which the individual customer

keeps buying until she tosses a head. The beta distribution is simply a means of

allowing

P (heads) to vary across the customer base

It follows that the aggregate distribution of the number of units purchased by a week  $w$  trialist is given by

$$\begin{aligned}
 P(T_w = x) &= \int_0^1 P(T_w = x | q_T) g(q_T) dq_T \\
 &= \frac{B(\alpha_T + 1, \beta_T + x - 1)}{B(\alpha_T + 1, \beta_T)}, \quad x = 1, 2, \dots \\
 &= 0, \quad x = 0,
 \end{aligned} \tag{II}$$

Which we call the shifted beta-geometric distribution (This distribution was used by Morrison and Perry (1970)[49] as a quantity sub model in their NBD-based model of purchase frequency and purchase quantity ) The mean of this distribution is given by

$$E(T_w) = \frac{\alpha_T + \beta_T - 1}{\alpha_T - 1} \tag{III}$$

#### 4B.3.2.1 Modeling Repeat Purchases

Let the random variable  $\mathbf{R}_{w|i}$  denote the number of (repeat) purchases made in week  $w$  by a customer who made her trial purchase in week  $i$  ( $w > i$ ). Specifying an appropriate model for the distribution of  $\mathbf{R}_{w|i}$  is the single most important step in this modeling effort. To do so, we will start with the assertion that the purchasing by a new customer at an established store (or website) is analogous to a consumer's purchasing of a new product. We know that repeat buying rates for new products tend to be non stationary - at least early in a new product's life (Fader and Hardie 1999a)[17] with the purchase rate declining (towards an equilibrium level) over time. One way to capture this pattern is to assume that, for a given cohort, the number of people making zero purchases in a given week grows (at a decreasing rate), which means that the observed average number of units purchased decreases over time.

The sub model for the distribution of  $R_{w|i}$  is based on the following three assumptions

(1) In week  $w$ , existing customers are either out of the market (definitely not going to make a repeat purchase that week) or a possible repeat buyer. The probability of a week  $i$  trialist being out of the market in week  $w$ , is denoted by  $\Pi_{w|i}$ . While such person may be out of market in week  $w$ , we are not assuming that she is permanently out of market; she may consider buying again in future weeks. We assume that this probability is governed by the following time-dependent distribution:

$$\Pi_{w|i} = 1 - \gamma(w - i)^\delta \quad w > i$$

When  $\delta < 0$ ,  $\Pi_{w|i}$  grows at a decreasing rate as  $w - i$  increases; consequently, the number

of week  $i$  triers making zero purchases in week  $w$  increases over time. Likewise,  $\delta$  can also

be positive, allowing for the possibility that the number of repeat buyers actually increases

over time. (The notion that someone is a possible repeat buyer does not ensure that she will actually purchase any units that week; it merely conveys the fact that she will consider purchasing with some non-zero probability.)

(2) For an individual who has been classified as a possible repeat buyer in week  $w$ ,  $R_{w|i}$  is

distributed according to a geometric distribution with parameter  $q_R$  and probability mass function

$$P(R_{w|i} = x | q_R) = q_R (1 - q_R)^x$$

$$x = 0, 1, 2, \dots; 0 < q_R < 1$$

(3)  $q_R$  is distributed across the population according to a beta distribution with parameters



R and R, and pdf

$$g(q_R) = \frac{1}{B(\alpha_R, \beta_R)} q_R^{\alpha_R-1} (1-q_R)^{\beta_R-1}$$

$$0 < q_R < 1, \alpha_R, \beta_R > 0$$

Qualitatively, the same type of coin-flipping story as discussed earlier for the trial sub-model applies here as well. Note, however, that there are two differences First, there is no longer a truncation at zero, i.e., the First coin-flip determines whether a possible repeat buyer actually chooses to purchase one unit (or more) Second, the stopping probability (P(heads)) is governed by a different beta distribution than that used for the trial purchasing process. It follows that the aggregate distribution of the number of units purchased in week w by a week i trialist (w > i) is given by:

$$\begin{aligned} P(R_{w|i} = x | q_R) &= \delta_{x=0} \Pi_{w|i} + (1 - \Pi_{w|i}) \int_0^1 P(R_{w|i} = x | q_R) g(q_R) dq_R \\ &= \delta_{x=0} \Pi_{w|i} + (1 - \Pi_{w|i}) \times \frac{B(\alpha_R + 1, \beta_R + x)}{B(\alpha_R, \beta_R)} \end{aligned} \quad (IV)$$

Where  $\delta_{x=0}$ , the Kronecker delta, equals 1 if x = 0, 0 otherwise. We call this the time-dependent, zero-inflated beta-geometric distribution. The mean of this distribution is

$$E(R_{w|i}) = \gamma(w-i)^\delta \frac{\beta_R}{\alpha_R - 1} \quad (V)$$

#### 4B.3.2.2 Parameter Estimation

Maximum likelihood estimates of the six model parameters ( $\alpha_i, \beta_i, \alpha_R, \beta_R, \gamma, \delta$ ) are found by maximizing the following log-likelihood function:

$$\begin{aligned} LL &= \sum_{x=0}^9 m_{1x} \ln[P(T_1 = x)] + \left(m_1 - \sum_{x=0}^9 m_{1x}\right) \ln\left[1 - \sum_{x=0}^9 P(T_1 = x)\right] \\ &+ \sum_{w=2}^{12} \left\{ m_{wx} \ln[P(X_w = x)] + \left(m_w - \sum_{x=0}^9 m_{wx}\right) \ln\left[1 - \sum_{x=0}^9 P(X_w = x)\right] \right\} \end{aligned} \quad (VI)$$

$$P(R_{w,t} = x) =$$

$$\left\{ \begin{array}{ll} = 1 - \gamma(w-t)^{\delta} \left( \frac{\beta_R}{\alpha_R + \beta_R} \right) & x = 0, \\ = \gamma(w-t)^{\delta} \left( \frac{\alpha_R \beta_R}{(\alpha_R + \beta_R)(\alpha_R + \beta_R + 1)} \right) & x = 1, \\ \left( \frac{\beta_R + x - 1}{(\alpha_R + \beta_R + x)} \right) P(R_{w,t} = x - 1) & x \geq 2 \end{array} \right\}$$

(VIII)

Combining these simplified expression back into (I) and then into (VI) completes our description of the model as actually implemented. While the log-likelihood function (VI) appears to be rather complicated - it involves the evaluation of 131 terms - each of these calculations is very simple and actually constructing this function in a spreadsheet can be done quite easily using basic cut and paste techniques.

#### • Parameters for CDNOW

Fader has found following parameters value for data of CDNOW\*

$$LL = -112,923.9$$

\*- Sales and other data are in appendix-1

$$\alpha_T = 6.901$$

$$\beta_I = 7.185$$

$$\alpha_R = 5.024$$

$$\beta_R = 5.595$$

$$\gamma = 0.122$$

$$\delta = -0.291$$

By using these parameters value, sales forecast for repeat and new customers are very close to actual sales. As we can see that  $\alpha_I < \beta_I$ ,  $\alpha_R < \beta_R$ , means given Beta distribution is negatively skewed. Graph of Beta distribution is:

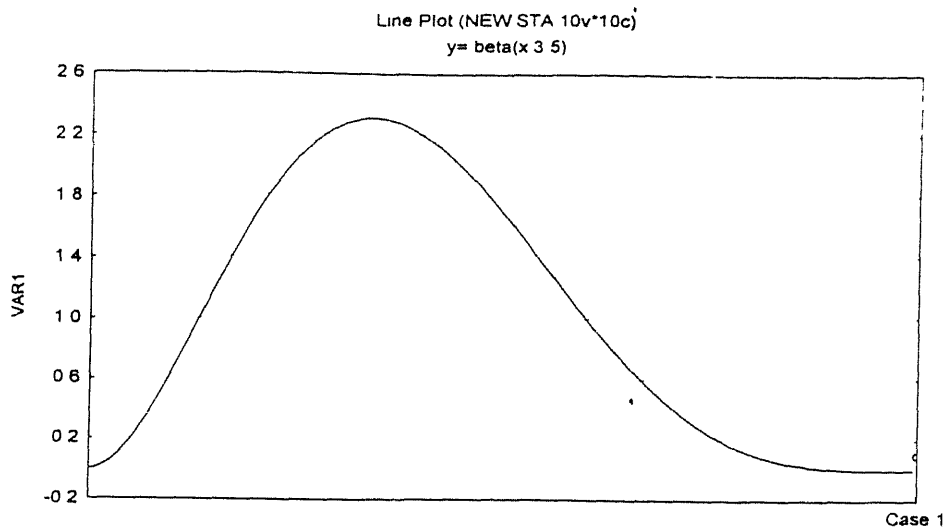


Figure 4B 3: Beta Distribution

From, the graph we can see that probability of lower range value is higher than any other value.

#### Parameter Estimation for Game

As explained in above model,  $\alpha_r, \beta_r$  are used to find purchase probability for the New Customers and  $\alpha_r, \beta_r, \delta, \gamma$  are used to find purchase probability for Repeat Customers.

Researchers (Shun Yin Lam et al , 2001 [36], Yalch and Spargenberg 1993 [81], Wansink et al.1998 [75]) have found that price promotion and product assortment have directly proportional to purchase probability and purchase quantity Researchers have also shown some empirical evidence for delivery policy (Ernst and Young study on “Global Online Retailing”, 2001 [68]) and purchase probability. As our aim to teach effects of marketing activities (here promotion and product assortment) on sales to students, we made  $\alpha_r$  &  $\beta_r$  are linear function of Promotion for new customers, Product assortment, and Delivery policy ,while  $\alpha_r, \beta_r, \delta$  &  $\gamma$  are linear function of Promotion for repeat Customers, Product assortment, Delivery policy, and Customer service level. We assume values for  $\alpha_r, \beta_r, \alpha_r, \beta_r, \delta$  &  $\gamma$  of CDNOW as a threshold value. Reason behind this assumption is: CDNOW is one of the top online music retailer and no other online retailer has sales data close to CDNOW Customer can

purchase maximum 10 units for one time purchase, because purchase probability for more than 10 units is very low for CDNOW

For, simplicity we have assumed value of  $\delta$  is same for all players and is equal to value for the CDNOW. We have also assumed repeat customer arrival probability up to 12 weeks, means if customer who arrived in 1<sup>st</sup> week, can arrive up to 13<sup>th</sup> week, after that if he/she arrives, he/she will consider new customer.

$\alpha_T, \beta_T = f(\text{Promotion for New Customers, Product range offered, Delivery policy})$   
 $\alpha_R, \beta_R, \gamma = f(\text{Promotion for Repeat Customers, Product range offered, Delivery policy, Customer service level})$

A promotion index is calculated by promotion that a player is offering and the product range index is calculated by the number of varieties a player is offering on the site, Customer service index is calculated by using no of orders completely fulfilled, no of orders partially fulfilled and no of orders cancelled, while delivery policy index is calculated by policy (free or charged) chosen by player and if it is charged delivery policy then it will compare with reference delivery charged.. Some weightage are given by the instructor to each index and then the above mentioned parameter and purchase probability of new and repeat customer are calculated. Probabilities calculations are shown in Appendix.

## **Chapter- 4C: Supply Chain and Inventory Module**

### **4C.1 Supply Chain**

A supply chain determines the nature of procurement of materials, transportation of materials to and from the company, operation to provide the service and distribution of the product to the customer, along with any follow-up service. From a value chain perspective, supply chain strategy specifies what operations, distributions, and service will try to do particularly well. Supply chain strategy includes supplier strategy, operations strategy, and logistics strategy. Decisions regarding inventory, transportation, operating facilities, and information flows in the supply chain are all part of supply chain strategy. A Company's success or failure is thus closely linked to the following keys.

1. The competitive strategy and all functional strategies must fit together to form a coordinated overall strategy. Each functional strategy must support other functional strategies and help a firm reach its competitive strategy goal.
2. The different functions in a company must appropriately structure their processes and resources to be able to execute these strategies successfully (Chopra [70], Chapter-2, 26-29)

#### **4C.1.1 How to Achieve Strategic Fit**

- Understanding the customer
- Understanding the supply chain
- Achieving strategic fit

##### *Understanding the customer*

Following are some of the important points to understand the customer:

- The quantity of the product needed in each lot.
- The response time that customers are willing to tolerate
- The variety of products needed
- The service level required
- The price of the product
- The desired rate of innovation in the product

The player has to select a supply chain, which is responsive, and an efficient. A Company's ability to find a balance between the two criteria is the key to achieve strategic fit. Holding higher level of inventory increases the responsiveness, whereas keeping inventory at low level increases the efficiency. Using faster mode of transportation increases responsiveness, whereas using slower modes generally increases efficiency. Having more facilities generally makes a chain more responsive whereas having central facilities creates more efficiency. Investing in information can vastly improve performance in both the dimensions.

#### **4C.1.2 Decisions to be taken**

Supply chain decisions may be described as Strategic (design), Planning, or Operational depending upon the duration over which they apply. Strategic decisions define constraints for planning decisions, and Planning decisions define the constraints for operational decisions.

Strategic decisions relate to supply chain configuration. These decisions have a long-term impact lasting several years. In this game, the player is a retailer, and he has to choose from four different options as discussed in the Third Chapter. Player can not change these decisions very often, by doing so he incurs a fixed cost.

Planning decisions cover a period of three months to a year and include decisions such as products, advertising, pricing, inventory, and promotions over that period.

Operational decisions span a few days and include promotion and giving orders to suppliers. While making orders many attributes of supplier's should be taken into consideration. Main attributes to look for, are price breakup quantities and quantity barriers, which a supplier imposes on a retailer to accept the order.

#### **4C.2 Inventory Management Module**

Cycle inventory is the average inventory that builds up because a stage of the supply chain either produces or purchases in lots that are larger than those demanded by the customer. Cycle inventory exists because producing or purchasing in large lots allows a stage of the supply chain to exploit economies of scale and lower cost. The presence of fixed costs associated with ordering and transportation, quantity discounts in

product pricing, and short-term discounts or trade promotions encourages exploitation of economies of scale and order in large lots

To determine an optimum inventory policy, information on each of the following parameters is required:

- Demand forecasts
- Appropriate inventory costs
- Lead times

The two fundamental decisions to be taken in any inventory system are how much and when to order. These decisions depend on the nature of inventory, demand and the parameters used to define the system.

#### 4C.2.1 Replenishment Policies

A replenishment policy consists of decisions regarding, when to reorder and how much to reorder. These decisions determine the cycle and safety inventories along with the product fill rate and the cycle service level. There are several forms that replenishment policies may take. Two main instances are – (Chopra [70], Chapter-8, 183-184)

- I. *Continuous review*: Inventory is continuously tracked, and an order for a lot size  $Q$  is placed when the inventory declines to the reorder point ROP. The size of the order does not change from one order to the next. If the demand is variable time between orders may vary. It may result in increased product availability; higher sales because of fewer stock outs, reduced lead time, increased consumer loyalty, and better customer service.
- II. *Periodic Review*: Inventory status is checked at regular periodic intervals, and an order is placed to raise the inventory level to a specified threshold. The time between orders is fixed. The size of each order however can fluctuate.

##### 4C.2.1.1 (s, S) Inventory Policy

Both of the above policy is implemented in this game. Player decides different parameters like review period. For inventory evaluation and ordering policy, (s, S) Inventory policy is adopted here, as it is suitable for the type of product being sold.

Small  $s$  is known as reorder point and big  $S$  as reorder level. In this inventory system as soon as inventory goes down below reorder point an order is placed equal to the difference between reorder level and current inventory level. Player decides  $(s, S)$  for different categories of cassettes and CDs. Inventory evaluation is done in every review period as decided by the player. See Figure 4 1

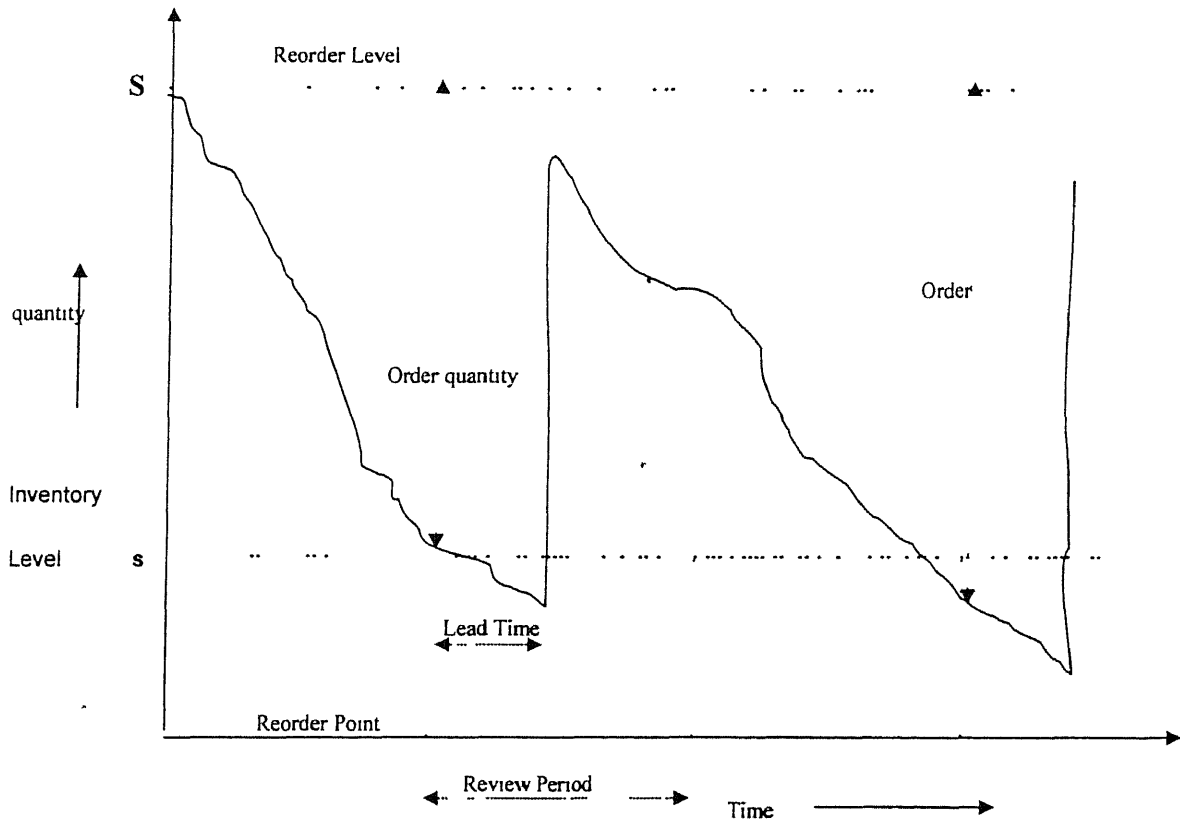


Figure: 4C 1:  $(s, S)$  inventory policy

#### 4C.2.2 Order Policy

Increase in range of product required, decrease in lead time, increase in number of channels through which product may be acquired, increase in rate of innovation and increase in required service level increases the uncertainty in demand.

In this game player is provided details of various suppliers available. The instructor is required to set supplier attributes. Attributes include Price of cassettes and CDs, Reliability of the supplier, Expected lead-time, and Quantity discount policy. The player is asked to choose one or more than one supplier. Amount to be ordered is calculated and displayed in the form of table to the player. The player can modify



through manual interaction, order quantities of each item. He can also decide whether to place an order or not depending upon the inventory in-hand and demand.

#### **4C.2.3 Ordering Costs**

Replenishment policy under conditions of certainty requires the balancing of ordering costs against inventory carrying costs. Ordering large quantities may result in inventory carrying costs in excess of the savings in ordering costs. Ordering costs for products purchased from an outside supplier typically includes-

- The cost of transmitting the order
- The cost of receiving the product.
- The cost of placing it in storage
- The cost of processing the invoice for payment.

#### **4C.2.4 Holding Costs**

A financial measurement that calculates all the costs associated with holding goods in storage, usually expressed as a percentage of the inventory value. It includes inventory-in-storage, warehousing, obsolescence, deterioration or spoilage, insurance, taxes, depreciation, handling costs, and capital cost of investment.

#### **4C.2.5 Order Fulfillment**

For any order, corresponding warehouse (warehouse nearest to the customer) is checked first and if item is not available there, then only other warehouses are checked (if any) in order to fulfill the customer order. The player can choose also to provide partial fulfillment policy, if desired by the customer. In that case player decides the criteria for the same. While efforts are made for complete fulfillment of orders, partial fulfillment is used as a compromise between on-time delivery and delivery cost. The player provides some kind of promotion in case of partial fulfillment to customers, like free shipping, to subsequent shipments.

#### 4C.2.6 Measuring Product Availability

Product availability reflects a firm's ability to fill a customer order out of available inventory. A stock out results if a customer order arrives when product is not available. Some of the important availability measures are- (Chopra [70], Chapter-8, 183-184)

- I *Product Fill Rate* The fraction of product demand that is satisfied from product in inventory. It is equivalent to the probability that the product demand is supplied from the inventory.
- II *Order Fill Rate* the fraction of orders that are filled from available inventory. In a multi product scenario, an order is filled from inventory only if all products in the order can be supplied from the available inventory. Partial fulfillment doesn't come in this category.
- III *Cycle Service level* The fraction of replenishment cycles that end with all the customer demand being met. A replenishment cycle is the interval between two successive replenishment deliveries. The cycle service level is equal to the probability of not having a stock out in a replenishment cycle.
- IV *Inventory Turnover Ratio* Inventory turnover is another measure of inventory performance. It is measured as:
 
$$\text{Annual Rupee sales volume at cost} / \text{Average Rupee inventory investment}$$

All else being equal, a higher number of the turnover ratio is preferred, indicating that inventory moves through the firm's operations quickly, rather than being held for an extensive period. For example, an item with annual sales of Rs 500000 valued at cost and an average inventory investment of Rs 100000 would have a turnover of five times. Turnover should not be used as the only measure of inventory effectiveness, but should be combined with other measures that reflect customer service issues.

### 4C.3 Shipping Policy

Two types of delivery have been provided in the game, *Normal* delivery and *Express* delivery. In case of normal delivery it will take 6-business day to reach to customer while in case of express delivery it will take 2 days only. Most online music retailers take 4-5 days to deliver cassettes and CDs to customer by normal delivery. Hence the player has been given two days to enable the product ordered by customer in case of normal delivery while in case of express delivery he has to provide it the same day.

#### 4C.3.1 Shipping Charges

Reference charges are taken from Planet-M online. The charges of Planet-M online are given in the following table-

Table 4C.1 Delivery charge

Product Type	Music	Video	CD-ROM	Audio Books	Accessories
Charge (Rs. per item)	5	10	15	5	15

All the above charges are for normal delivery. In this game only music cassettes and CDs are the products for which Rs. 5 per item has been taken as reference charge. In case of express delivery Rs. 10 per item is taken.

The player can also choose to provide free shipment to customers. Alternatively the player can also choose his charges different than the reference charges. The impact of shipping charge is reflected in a customer's purchase probability described in the Chapter 4B.

In case a customer selects Payment mode COD, Customer is required to pay a delivery charge as fixed by the player. Representative numbers as given by Planet-M are shown in the table below-

Table 4C.2 COD charges

Order value (INR)	400 – 3000	3001 – 4000	4001 – 5000	Above 5000	Accessories
COD Charges (INR)	35	50	75	100	15

#### **4C.4 Supplier Strategy**

The Instructor can set utmost five suppliers / distributors. The Instructor has to set their attributes as described earlier. The player can see suppliers' details, each time an order is placed. Order quantities, evaluated using (s, S) Inventory policy, will be displayed to the player. The player can change order quantities as well as choose suppliers manually. Thus, provide flexibility to the player to review and place order manually or go along with pre-selected order choices.

#### **4C.5 Warehousing / Storage**

Warehouses have traditionally provided storage of products (inventory) during all phases of the logistics process. In our case, finished goods, Cassettes and CDs have to be stored. Warehousing of products is done due to some of the following reasons, which also applies in this case:

1. Achieve transportation economies.
2. Take advantage of quantity purchase discounts and forward buys.
3. Maintain a source of supply.
4. Support the firm's customer service policy.
5. Meet changing market conditions e.g. demand fluctuations.
6. Provide customers with a mix of products instead of a single product in each order.

In this game, the player can choose the number of warehouses he/she wants. Each warehouse here is assumed to be a Public warehouse. In this case, the player pays for material handling and rental costs on a monthly basis. As the number of warehouses increases (decentralized warehousing), lead time to reach the customer as well as operating costs decreases. But this is only with the case of Public warehouses. If the Company owns warehouses, as decentralization increases, costs also shoot up (Fundamentals of Logistics [15] 268).

## **Chapter 5: Instructor's Manual for the Game**

### **5.1 What is the game all about?**

#### **5.1.1 The Background of the Game**

The development of this game was initially motivated by the fact that there exists so many games but none exists that can teach the concepts of e-commerce or online retailing. While there exists so many games catering to different specialized fields, but none exists that has an integrated approach to teach all the aspects of business including marketing, supply chain management and business policy. This game is an integrated effort towards providing a common platform to learn about online business as a whole.

#### **5.1.2 Why a Simulation Game**

This game is a simulation specifically designed for teaching concepts of marketing, operations management and finance. Its development was motivated by our dissatisfaction with the traditional pedagogical tools of lectures, readings and cases to teach these concepts effectively at the end in basic marketing, operations management course, or in executive programs. The issues that this game was developed to address can be expressed in the following terms:

- I. The discrepancy between knowledge of the concepts, internalization of these concepts, and their ready use by participants when faced with a business problem related to marketing or operation's management
- II. The difficulty of visualizing and putting into use some marketing and operation's management concepts, such as market share/profitability, impact of marketing mix variables over time, inventory management, logistics, their relationship with short and long term perspectives, experience effects, barriers to entry or competitive advantage.
- III. The inadequacy of "static" approaches in giving participants an experience on the role and value of allocation of resources to different activities over time, to visualize long term and short term impact of decision making.
- IV. The difficulty of illustrating beyond the analysis stage different concepts in the course of marketing and operation's management

Above are the some problems in teaching of courses such as marketing, operations management or business policy To solve these pedagogical problems, we have opted for the development of a simulation because it provides a natural setting for planning, control, feedback and adaptation of business activities, and because it creates a competitive and highly motivational environment conducive to effective learning, assimilation and internalization.

### **5.1.3 The Advantages of this Simulation Game**

There are several advantages offered by simulation games as pedagogical tools and they have been extensively described in the literature, motivation, involvement, feedback, dynamism, time representation, competition, integration and group decision-making are words often used to describe these advantages As a simulation, this game possesses most of these qualities

This game can be used in the courses of marketing, operations management and business policy to make students familiar with the basic terminologies and concepts by making them participate in playing the game This game offers the following advantages:

- I. Simulated periods of 2 years which make long-range planning feasible and which allow a long term evaluation of strategies
- II At the same time an emphasis is given to the operational decisions which a player can take after each review period to tackle with the day to day problems in managing his/her supply chain elements, promotional schemes etc
- III. The possibilities of doing business by different business models keeping in mind the objectives one is trying to accomplish. One of the important things in online business environment is that a player can do business even without maintaining the physical inventories, but it is easier said than done, it has its own sets of problems Therefore different set of online business models are provided in the game to enrich the learning experience.
- IV. The players will get a rich exposure of designing a site, different types of cost involved in designing a site, different types of payment gateways, their attributes and practical difficulties, delivery policies and the impact of each on customer acquisition. The simulated business phenomena are

so intricate and the number of strategic and operational decisions is wide, so that learning behavior, rather than “gaming” behavior is adopted by participants

- V Finally, music retailing has been selected as we believe that the experience gained in the design and implementation of online business in this type of product is more easily generalized to apply to a wide range of products that are sold online.

## **When to Use This Game?**

This game is specifically been designed for use:

- In the later part of a basic operations management course.
- In the later part of a basic marketing course.
- In a course or executive program on online retailing

In any of these courses, this game can be used in conjunction with lectures, readings and cases, or by itself. It can be administered over several weeks in a semester course, or concentrated over three full days in a short executive program. It can be given as an assignment outside the classroom, or group sessions may be planned during the regular teaching hours when the instructor is available for interaction with the participants

The use of this game is very flexible and after reading this manual, the instructor can administer it accordingly to his or her own needs.

## **5.2 Getting Organized for Playing the Game**

This portion contains instructions and suggestions on getting the computer related details for running the simulation game.

### **5.2.1 Computer and operating system requirements**

Microcomputers require two types of software to operate: operating system software and applications software. This simulation game is a java based application, it can be run on any operating system with JDK (Java Development Kit) or JRE (Java Runtime Environment) installed on it. These applications are platform independent application program which can be downloaded for free from [www.java.sun.com](http://www.java.sun.com).

### **5.2.2 Copying the Simulation Game on to a Hard Disk**

The easiest and best way to administer the simulation game is to install the software in a subdirectory on the computer's hard disk and then to run the program. If possible we recommend that one use this option. However it is also possible to run the software from the CD.

### **5.2.3 Running the Programs**

This portion explains how to play the game. It contains information both for the instructor (one who set up various different parameters of the game for the players, generally the course instructor) and the players.

### **5.2.4 Using the Input Screens**

The computer screens in the simulation game were designed keeping in mind look and feel and easy to use. However the automatic checking of wrong values in the screens is yet to be implemented, therefore it is recommended that an instructor should check all the values entered by the player. Below are the guidelines for entering the values in the input screens:

- 1 While combo box has been designed wherever possible so that a player just has to select the proper values, but if there is a text field and the player has to enter a value, do not type commas or any other special character in the field.
2. Before going to the next screen, one should check all the values entered in the screen.
- 3 If one has entered the wrong values and wants to go back, one can do so by clicking on the back button in the screen and then removing the previously entered values and entering the new values.

## **5.3 Reference Information on Individual Screens**

Given below are the details of all the screens in the simulation game. One need not be worry about learning all of these details. The computer screens were designed in a self-explanatory way, if one finds something confusing or if one is not clear about something then he/she can refer to the details given below.

### **5.3.1 Main Menu**

After copying the programs on the computer disk and installing JDK/JRE, at command prompt write the following instruction.



C:\programdir\>java mainmenu

The following screen will appear after this command

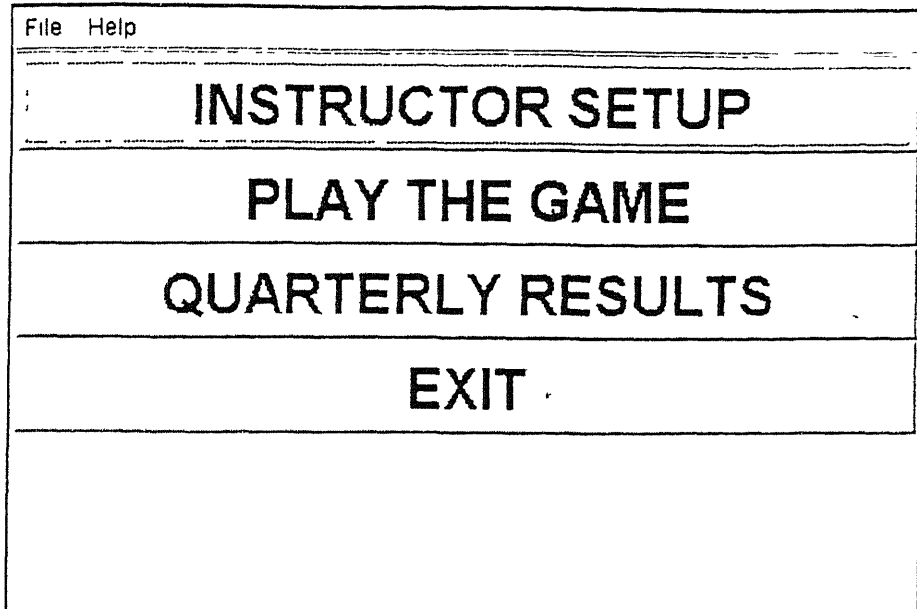


Figure 5 1

### 5.3.2 Instructor Setup (option 1 on the main MENU screen)

This option is password protected, and only instructor has the privilege to alter the values in this screen. The default password set is "instructor" (all letters in lower case). Instructor can change the password in the instructor screen.

After clicking on the setup option and verifying the password, the screen given on the next page will appear.

#### 5.3.2.1 Market Environment

**Purpose:** This module is used to set up the market environment for the players in terms of potential population size, competition, variables affecting performance, different costs etc.

**When to Use:** Use before players enter the data or running the simulation for the first time. Once the game is underway, instructor can change the setup after every three months simulated time.

**Instructions:** Fill all the fields, don't skip any field. The screen will let one specify the following:

File Help	
SET NEW PASSWORD IF YOU WANT	
Online Market Potential	hi
Advertising Effectiveness	5000000 0
Promotion Effectiveness	
% CD Market (Range 0 to 100)	5 0
% Cassette Market (Range 0 to 100)	95 0
CD Reference Price	300 0
Cassette Reference Price	60 0
VARIABLES AFFECTING ARRIVAL RATE & PURCHASE PROBABILITY	
Impact of Delivery Policy (Range 0 to 100)	40 0
FOR NEW CUSTOMERS	
Impact of Product Range (Range 0 to 100)	50 0
Impact of Promotion Range (Range 0 to 100)	50 0
FOR REPEAT CUSTOMERS	
Impact of Product Range (Range 0 to 100)	40 0
Impact of Promotion Range (Range 0 to 100)	100 0
Impact of Customer Service Level (Range 0 to 100)	100 0
INVENTORY RELATED COSTS	
Order Cost ( Rs.)	300 0
Incremental Cost( Rs. per Item )	1 0
Holding Cost in Percentage of Inventory Value	20 0
FINANCE FOR EACH PLAYER	
Maximum Loan Amount	1 0E7
Interest Rate in Percentage	12 0
BACK	NEXT
RESET	

Figure 5 2

**Set Password:**

First field is instructor's password. It displays the default password; instructor can change this password by entering a new string in to the field. The changed password is required, while entering again to this screen.

**Population size:**

In simulation game a fictitious world is assumed whose monetary unit is Rupee. In this world both inflation and GNP growth rate are fairly stable, and no major social, political or economic event is anticipated in the near future. The potential population size of which is to be decided by the instructor, any value can be set by the

instructor, but we recommend entering values between 5 million and 10 million, too less a value may not provide enough market for the players to target whereas too much potential population may tends to give wage results

***Advertising Effectiveness:*** This is basically for setting the competitive environment (in terms of awareness created due to advertising) If advertising effectiveness is high, it means that the environment is not very competitive and the returns are directly proportional to advertising expenditure If advertising effectiveness is medium or low, it signifies the highly competitive environment, and the advertising done by a player is getting affected by the competitors and the returns will be less in terms of awareness created per unit of money spend on advertising.(Refer Kotler, 586-587)

***Promotion Effectiveness:*** This is similar to advertising effectiveness. If promotional effectiveness is low than that means that overall market scenario is such that most of the competitors are running high promotions, so the player's promotional schemes effect will be nullified and it will have low impact on the purchase probability and quantities purchased by a customer and vice versa. (Refer: Kotler, 597-605)

***CD & Cassette Market Share:*** Instructor will decide the overall market share of CD and Cassettes, this will have effect on the purchasing behavior of the customer and hence on the inventory management policy of the player By default the CD market share is assumed to be 5% and Cassette market share 95 %.( source: Indian Music Industry Association)

***Reference Price of CD and Cassette:*** Here instructor will set the reference price (a price that the consumer pays most frequently, paid last, or pays, on average, for goods in this category) of CD

and Cassette This reference price will be displayed to the player for setting his pricing policy

***Impact of Delivery Policy (0-100):*** Player decides his/her delivery policy which can be either free or charged. If he/she chooses charged delivery, then he/she has to decide delivery charging structure. An index is calculated based on reference price of delivery charge set by the instructor and the charging structure of the player. That index will impact on the *conversion rate* and *quantity purchased*. Here, instructor has to decide how much weightage a customer usually gives to delivery charges while deciding to purchase on the site. Its value ranges from 0-100, 100 denoting that customer gives very high weightage to delivery charges while making purchasing decisions while 0 denotes that the delivery charges really doesn't matter to the customers while making purchasing decisions.

***Impact of product range (0-100):*** An index is calculated based on the product range that a player is offering and the product range that his/her competitors are offering. That index will impact on the *conversion rate* and *quantity purchased*. Here, instructor has to decide how much weightage a customer usually gives to product range while deciding to purchase on the site. Its value ranges from 0-100, 100 denoting that customer gives very high weightage to product range while making purchasing decisions while 0 denotes that the product range really doesn't matter to the customers while making purchasing decisions (Refer: Gilbert, 102-103)

***Impact of Promotion (0-100):*** An index is calculated based on how much promotion one is offering taking into consideration the competition and promotional effectiveness. Since there are separate promotional policies for repeat and new customers, therefore separate index is calculated for new customers

and old customers. This index will impact on the *conversion rate* in case of new customers and *quantity purchased* for both old and new customers. Here, instructor has to decide how much weightage a new and old customer usually gives to promotion while deciding to purchase on the site respectively. Its value ranges from 0-100, 100 denoting that customer gives very high weightage to promotion while making purchasing decisions while 0 denotes that the promotion really doesn't matter to the customers while making purchasing decisions.

***Impact of Customer Service level (0-100):*** An Index is calculated based on the penalties given to number of orders cancelled, delayed, partially fulfilled to the total number of orders received. It depends on the player's inventory management policy and supply chain structure. This index will affect the arrival rate of repeat customers. Here, instructor has to decide how much weightage a repeat customer usually gives to customer service level while deciding to purchase again on the site. Its value ranges from 0-100, 100 denoting that a repeat customer gives very high weightage to customer service level while making purchasing decisions while 0 denotes that customer service level really doesn't matter to the repeat customers while making purchasing decisions. (Refer: Hanson 163-167)

***Ordering Cost (In Rs):*** Order Cost is the fixed cost, player incurs each time he/she places an order, it includes transportation, order tracking, communication costs etc. It is independent of the order size. If a player decreases review period length then his/her ordering cost will shoot up, while too long a review period will increase his inventory holding cost. (Refer: Chopara, 171)

***Incremental Cost (In Rs):*** It is the variable costs associated with ordering, it is calculated on the number of units ordered. If instructor feels that the ordering cost is dependent on the lot size then incremental cost per unit can be fixed here. By default it is set to zero.

***Holding cost (% of acquisition cost per item per annum):*** It denotes Annual Inventory Carrying costs in terms of percentage of inventory value. It is applicable only if a player is maintaining inventory of items, if a player is outsourcing then this cost is not applicable (Refer Chopara, 140)

***Maximum loan availability (In Rs):*** Here instructor will fix the maximum loan available to each player. Throughout the game a player cannot take loan more than the maximum amount available. Here we assume that a player doesn't have equity to invest in the business and all the money that one is going to invest in the business will be through loan taken by the player.

***Interest Rate (%):*** Here instructor will set the interest rate in percentage that will be charged from the players against the loan taken by them.

After filling all the above fields and checking them, click the next button on the screen. The following screen will appear:

#### **5.3.2.2 Delivery Policy**

**Purpose:** This module is used to set up the delivery policy related costs.

**When to Use:** Use before players enter the data or running the simulation for the first time. Once the game is underway, instructor can change the setup after every three months simulated time.

**Instructions:** Fill all the fields, don't skip any field. We have provided delivery policy related costs by default from the data gathered from the survey of online music stores, but instructor can modify them. The screen will let one specify the following:

File Help			
TYPE OF DELIVERY		REFERENCE COST	
Normal (Rs./Item)		5.0	
Express (Rs./Item)		10.0	
PLAYER'S CONTRACT WITH COURIER			
DELIVERY TYPE	UP TO UNITS	Rs./Item	INCREMENTAL(Rs./Item)
Normal	100	4.0	3.0
Express	100	8.0	5.0
BACK		NEXT	

Figure 5 3

**Reference Price of normal, express and COD:** Here, instructor will set the reference price (a price that the consumer pays most frequently, paid last, or pays, on average, for goods delivery in this category) of the delivery charges per item. This price will be displayed to the player for deciding his delivery policy

**Player's contract with courier:** Instructor decides the contract that a player is going to have with the courier service for paying the cost of delivery charges

After filling all the above fields and checking them, click the next button on the screen. The following screen will

### 5.3.2.3 Website Design Cost -1 of 2

**Purpose:** This module is used to set up the costs related to website management in-house. These costs will be displayed to player while he/she designs his/her retail shop, which will be incurred by player depends on his/her choices  
(Refer Hanson, 253-325)

**When to Use:** Use before players enter the data or running the simulation for the first time. Once the game is underway, instructor can change the setup after every three months simulated time

**Instructions:** Fill all the fields, don't skip any field. We have provided the all costs by default, but instructor can modify them. The screen will let one specify the following .

File Help	
<b>INHOUSE WEBSITE MANAGEMENT</b>	
<b>ONE TIME FIXED COST</b>	
Domain Name Cost	2500
Web Hosting Cost	50000
Hardware Cost	200000 0
Shopping Cart Cost	10000
Payment Gateway Cost (For Credit/Debit Card)	50000
<b>OTHER WEB FACILITIES COST</b>	
<b>FACILITY</b>	<b>ONE TIME COST    MONTHLY COST</b>
Registration	5000    5000
Chat room	7500    10000
Search Engine	2500    10000
Sample Music Download	10000    10000
Music Ratings	8000    10000
Music Newsletter	14000    10000
Overheads and Salaries per Warehouse	15000
Web Maintenance Cost (including salaries)	10000
<b>BACK</b>	<b>NEXT</b>

Figure 5 4

After filling all the above fields and checking them, click the next button on the screen. The following screen will appear:

#### 5.3.2.4 Website Design Cost -2 of 2

**Purpose:** This module is used to set up the costs related to website management outsource. These costs will be displayed to player while he/she designs his/her retail shop, which will be incurred by player depends on his/her choices.

**When to Use:** Use before players enter the data or running the simulation for the first time. Once the game is underway, instructor can change the setup after every three months simulated time.

Player can choose either his/her own website management or outsource website management. In either case, cost will be different. In formal case, there is some



fixed cost will be incurred, while in latter case, there is no fixed cost, but monthly rental to be paid

**Instructions:** Fill all the fields, don't skip any field We have provided the all costs by default, but instructor can modify them The screen will let one specify the following

File Help	
<b>OUT SOURCE WEBSITE MANAGEMENT</b>	
Payment Gateway Cost (For Credit/Debit Card)	
Domain Name Cost	
Web Hosting Cost	
Shopping Cart Cost	
Web maintenance Cost(including salaries)	
<b>TOTAL COST PER MONTH FOR THE COSTS SHOWN ABOVE</b>	10000
<b>OTHER WEB FACILITIES COSTS</b>	
<b>FACILITY</b>	<b>MONTHLY COST</b>
Registration	5000
Chat room	7500
Search Engine	2500
Sample Music Download	10000
Music Ratings	8000
Music Newsletter	14000
Overheads and Salaries per Warehouse	15000
BACK	NEXT

Figure. 5.5

**Domain Name Cost:** When one starts new website, one has to purchase domain name (www.yourname.com), this cost called domain name cost After the initial two years, one must renew the name every year for one half of the purchase price

**Web Hosting Cost:** To get one's website on the internet, one has to rent space on a computer that has high speed internet access. This is called hosting.

**Hardware Cost:** When one starts e- commerce business, one has to purchase some hardware (Computers, Printer/s, Modem,

etc) depends on his/her business size. This hardware is depreciable

***Shopping Cart Cost:***

If one wish to sell products on the internet, one will need to purchase or lease the software to take orders and collect credit card information. This is his/her shopping cart. Here, for own web site, we assume players will purchase software for shopping cart.

***Payment Gateway Cost:***

To use credit cards on website, one will need to get a merchant account (payment gateway). This is an account that accepts and processes credit card/debit card transactions. Some fixed will be incurred first time, when one gets this account in addition to per transaction cost

***Total outsource cost (monthly):*** One can out source whole web site management. He/She has to pay monthly charges to out source web site. Here, one can save significant amount for fixed cost but same time he/she might have incurred more expenses per monthly. This monthly rental doesn't include other facilities (Registration, Chat room, Music new letter, etc) charge

***Registration:***

To trace repeat customers and to do email marketing, one has to provide registration of his/her customers on the site. For this, one has to purchase software which can provide this facility

***Chat Room:***

To provide artists chat to customers (which can be useful to attract more customers and thus sales), one can provide chat room. For this, one has to purchase software which can provide this facility. Also one has to pay monthly rental to use this software and some cost will be paid to artists for their services.

***Search Engine:***

Search engine helps customers to find specific product variety. For this, one has to purchase software which can provide this facility. Also one has to pay monthly rental to use this software.

**Sample Music Download:** Sample music download is very useful to attract customers. For this, one has to purchase software which can provide this facility. Also one has to pay monthly rental to use this software.

**Music Ratings:** Rating of song provides popularity of particular song/album. Customer purchase rate is also depends on rating of a given album. For this, one has to purchase software which can provide this facility. Also one has to pay monthly rental to use this software and some cost involve to get ratings from authenticate source.

**Music Newsletter:** Music newsletter can provide latest music related news to music lovers. It can also help to build community. For this, one has to purchase software which can provide this facility. Also one has to pay monthly rental to use this software and to pay some cost to get music industry information.

**Overhead and Salaries per Ware House:** To maintain warehouse, one has to pay overhead (rent, electricity bill, etc) and salaries to work force. Here, we assume that player doesn't buy any ware house, therefore he has to pay only rent for ware house/s and other cost to maintain it/them.

**Web maintenance Cost:** To keep your site on line, you have to pay your annual hosting fee, your annual domain name renewal. If you website needs updating, there are site maintenance charges. This cost only for own web site management.

After filling all the above fields and checking them, click the next button on the screen. The supplier attributes table will appear.

#### **5.3.2.5 Suppliers' Attributes**

**Purpose:** This module is used to set up the suppliers attributes that will be available to the player for procuring goods.

**When to Use:** Use before players enter the data or running the simulation for the first time. Once the game is underway, instructor can change the setup after every three months simulated time.

<b>Instructions:</b>	Fill all the fields, don't skip any field. We have provided the suppliers attributes by default, but instructor can modify them. The table will let one specify the following: The suppliers are differentiated on the basis of the following attributes:
<b>Supplier Number:</b>	A supplier number is given to each supplier for identification purpose in the program. Maximum five suppliers an instructor can set in this table.
<b>Supplier Type:</b>	There can be different types of suppliers, such as manufacturer, wholesaler, distributor etc. The instructor has to specify the type of supplier so that it will be easy for the player to select among them.
<b>Lead Time:</b>	Lead time is the time interval between placing an order to the supplier and receiving the same. The instructor has to fix lead time for each type of supplier.
<b>Reliability:</b>	It denotes that what are the chances that one will receive the order from the selected supplier within lead time of that supplier. For example, if a supplier has reliability 0.90 and lead time of three days, then it means that the probability of arrival of order from the supplier within three days is 90%.
<b>Minimum quantity:</b>	It specifies the minimum lot size that a supplier will accept. That means if a supplier has specification of minimum Quantity size = 500, and if a player chooses this supplier then order of at least 500 units should be given to the supplier.
<b>Quantity Discount:</b>	It specifies the quantity discount policy of the supplier, i.e. after how much quantity a supplier offers discount.
<b>Discount Rate:</b>	It specifies the discount rate offered by the supplier, on the units above the discount quantity.
<b>Margin:</b>	It is applicable if the player passes order directly to the supplier, and the supplier offers some margin as

percentage of total price of customers orders passed to him. It is expressed in percentage.

**Cost of Items Available:** The cost of items that a supplier will supply is to be entered here by the instructor. If an item is not available with the supplier then the instructor can leave that field blank or enter zero in that field.

After filling all the above fields and checking them, click the next button on the table. The payment mode attributes table will appear:

### 5.3.2.6 Payment Modes' Attributes

**Purpose:** This module is used to set up the payment mode that will be available to the player for offering to his customers.

**When to Use:** Use before players enter the data or running the simulation for the first time. Once the game is underway, instructor can change the setup after every three months simulated time.

**Instructions:** Fill all the fields, don't skip any field. We have provided the payment modes by default, but instructor can modify them. The screen will let one specify the following

File Help			
PAYMENT MODE	CREDIT/ DEBIT CARD	CHEQUE/ DEMAND DRAFT	CASH ON DELIVERY
Cost per Transaction (% of order value)	0 0	0 0	0 0
Selection Probability (range 0 to 1)	0 0	0.0	0.0
Realization Time (in days)	0 0	0 0	0.0
Realization Probability (range 0 to 1)	0 0	0.0	0 0
Default Rate (in %)	0 0	0 0	0 0
<div style="display: flex; justify-content: space-between; width: 100%;"> <span>BACK</span> <span>NEXT</span> </div>			

Figure: 5.6

The payment modes are differentiated on the basis of the following attributes:

**Payment Type:** The instructor has to set different payment types that a player can offer on his/her site. By default, credit/debit

	card, cheque/draft, cash on delivery are provided in the table. Instructor can modify these options
<b><i>Operational Cost:</i></b>	The instructor will set the operational cost associated with payment mode type in percentage of per transaction cost. Some default values are provided, instructor can modify them.
<b><i>Realization Time:</i></b>	The instructor has to set the time associated with each payment mode after which the payment will be realized. For example if the realization time associated with the credit card is 5 days, and a customer chooses to pay with the credit card, the player will get the cash after 5 days of the transaction.
<b><i>Realization Probability:</i></b>	The instructor has to set the probability associated with the realization time. That means, if the probability associated with a particular payment mode is 90 %, it signifies that the chance of getting the cash from the associated payment gateway within the realization time is 90%
<b><i>Default Rate:</i></b>	The instructor has to set the default rate associated with each payment mode type in percentage. For example, if the default rate of a payment mode is 2 % that means out of 100 customers opting for that payment mode there is a possibility that 2 customers may be fraud.
<b><i>Selection Probability:</i></b>	The instructor has to set the selection probability of the different payment modes set by him, the selection probability means that what are the chances that a customer will select this payment mode. The selection probability for each payment mode should be between 0.0-1.0 and the total sum of all the payment modes set by the instructor should be 1 0.

After filling the entire payment mode attributes, the instructor set up is complete.

Now the game is ready to be played by the player. In the next section we will describe the screens that the player will fill while playing the game. The next section can be referred both by the instructor and the player.

### 5.3.3 Start the Game (option 2 on the main MENU screen)

After instructor sets market environment, the game is ready to be played by the player

Now instructor can give the game to be played by the player. The description followed is about the various decisions screen for the player. One need not be worry about learning all of these details as the computer screens were self-explanatory, if one finds something confusing or if one is not clear about something than he/she can refer to the details given below.

After clicking on the start game option, the following menu appears.

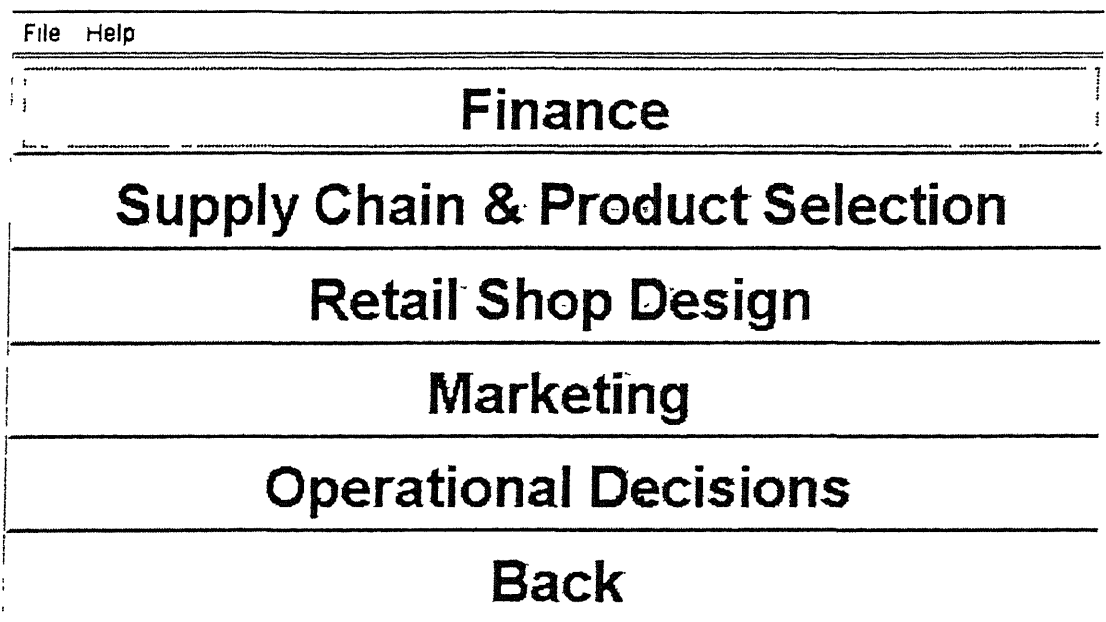


Figure: 5.7

<b>Purpose:</b>	This module is to be used by the player to take strategic decisions about his/her business in various different fields of marketing including finance, supply chain management, product range, marketing budget, pricing policy, delivery policy etc.
<b>When to Use:</b>	Use by the players enter the data or running the simulation for the first time. Once the game is

underway, player can change the strategic decisions after every three months simulated time

**Instructions:**

Fill all the fields, don't skip any field. The screen will let one specify the following

**5.3.3.1 Option-1: Finance**

After clicking on the finance button the following screen will appear

File Help	
<b>FINANCIAL DECISIONS</b>	
TOTAL LOAN AVAILABLE	10000000
LOAN TAKEN TILL DATE	0
MAXIMUM LOAN AVAILABLE IN CURRENT PERIOD	10000000
INTEREST RATE	12.0
LOAN EXPENDITURE (% OF LOAN TAKEN)	2.0
Loan Taken in current Period (in Units of Lakhs)	0.0
Loan Repayment Amount in Current Period (in Units of Lakhs)	0.0
<div>BACK</div> <div>NEXT</div>	

Figure. 5.8

This screen is for taking all the finance decisions related to the business. Various fields in the screen are described below.

**Total Loan Available:** It displays the maximum loan available to the player, as set by the instructor. The player cannot take cumulative loan more than that is specified in this field. The player cannot enter or modify this field.

**Loan Taken till Date:** It displays the total loan taken by the player up to date in the game. The player cannot enter or modify this field.

**Maximum Loan Available in Current Period:** It displays the maximum loan that a player can take in the current period. It is the difference of maximum loan available and loan taken till date. The player cannot enter or modify this field.



<b><i>Interest Rate:</i></b>	It displays the interest rate that will be charged from the player against his/her outstanding loan. This interest rate is set by the instructor. The player cannot enter or modify this field.
<b><i>Loan Expenditure:</i></b>	It displays the expenditure that will be incurred in getting a loan from the bank. It includes all the paper works and communications cost. It is expressed as the percentage of total loan taken. The player cannot enter or modify this field.
<b><i>Total Loan Taken in Current Period:</i></b>	Here player has to enter the amount of loan that he wants to run his/her business from the bank. The player should anticipate in advance all the expenses that he will incur in the coming period, since new loan can be applied only after three months.
<b><i>Loan Repayment:</i></b>	Here player has to enter how much money he/she wants to pay back to the bank, in the current period. It should be in units of lakh, that means a player cannot pay the money less than 1 lakh and additional in unit of lakhs. The day one pays the loan, interest will be charged only on outstanding loan.

After checking all the values the player should take all the decisions, since this screen will be displayed only after three months. After clicking next the Strategic Decisions screen will again reappear (Refer any book of Managerial Accounting)

### 5.3.3.2 Option-2: Supply Chain and Product Selection

After clicking on the Supply chain and product selection button the following screen will appear (Refer Bayles)

File Help

**SELECT SUPPLY CHAIN**

☐ **Online - In House** Select No of Warehouses

☐ **Online Outsource Single Order passing**

☐ **Online Outsource Clubbing of Orders** Set Ordering Period

☐ **Online and Offline** Select No of Locations

**BACK** **NEXT**

Figure. 5 9

This screen is for taking all the decisions related to the business model and the products offered by the player. Various fields in the screen are described below

**Online Outsource Single Order Passing:** This is one of the most simple business models that a player can opt for. In this model, the player will simply take the order from the customers and pass them directly to the suppliers. He will not be keeping any physical inventories; the supplier will supply the orders directly to the customers. The player will make money based on some percentage that he/she will get on the customers orders passed to the supplier. Here there will be no risk for the player for the obsolescence of the physical inventories, neither will he/she have to worry about dispatches and courier, since everything will be taken care of by the supplier. But on the other side the player may be losing an opportunity by keeping physical inventories and selling them directly to the customers thereby making more profit.

**Online Outsource Clubbing of Orders:** This is another business model in which the player will order to the supplier based on the number of orders that he is going to receive from the customers.

The player itself will be dispatching the goods to the customers through contracted courier agency. Here player is not taking the risk of anticipating future demand and maintaining physical inventories. The player will have to decide for how many days he/she is going to club the orders and then place to the suppliers. Too short a period may lead to higher ordering cost and lost of opportunity to avail quantity discounts from the supplier, while too large clubbing period may lead to delays and cancellation in customer's orders. One has to make a balance between different elements in the supply chain to fulfill orders in time.

***Online In-house:***

In this business model, the player will be keeping physical inventories; he/she will have a set of warehouses, this is a full fledged business model in which the player will have its own inventory management policy, he/she has to decide the number of warehouses that one is going to keep, as the number of warehouses will increase, the delivery cost to the player will decrease as well as the customer service level will increase. The player will have to anticipate the future demand to maintain optimal inventory level. Costs and risks are high in terms of inventory holding cost, obsolescence cost, warehouse maintenance costs etc, but at the same time returns are high in terms of higher customer service level and high profits. It all depends on how much traffic one is able to generate on the site.

***Online and Offline:***

This is multichannel retailing model, in which one will have online as well as offline stores. One has to decide on the number of offline stores that one is going to keep, these stores will also act as warehouses for the customer orders received online. Player will be keeping some physical inventories in his/her offline stores, will have his/her own inventory management policy. This

model is similar to the previous one but with offline stores also. The risks are high but at the same time there may be high returns due to customers having access to both online and offline stores.

The player should take this decision carefully keeping in mind his objectives and risk taking capability. This decision once taken, player will be able to change it after three months.

After taking this decision click on the next button, the following screen will appear.

#### 5.3.3.2.1 Product and Variety Selection

(Refer Gilbert 169-174)

File Help

**SELECT PRODUCTS AND VARIETIES**

<input type="checkbox"/> <b>CD</b>	Ghazhal	<input type="checkbox"/> <b>CASSETTE</b>	Ghazhal
	Oldie		Oldie
	New Release and Pop		New Release and Pop
	Classical		Classical

**BACK** **NEXT**

Figure 5.10

#### *CD Variety Selection:*

Here player will have to take decision regarding the product range that one is going to offer in CD. Basically music CD's are divided into four categories, Oldies, Ghazals, New release and Pop, and Classical. Before deciding this one must have some idea in his mind about the market share of CD sales as compared to cassettes, and also about each subcategory. One must choose varieties keeping in mind that CD is a high cost product and thereby high holding cost and obsolescence.

cost Too small product range may not be able to attract customers whereas too large a product range may lead to high holding and obsolescence cost.

**Cassette Variety Selection:** Here player will have to take decision regarding the product range that one is going to offer in Cassettes Basically music Cassettes are divided into four categories, Oldies, Ghazals, New release and Pop, and Classical. Before deciding this one must have some idea in his mind about the market share of Cassettes sales as compared to CD's, and also about each subcategory One must choose varieties keeping in mind the costs in holding and obsolescence Too small product range may not be able to attract customers whereas too large a product range may lead to high holding and obsolescence cost

After taking these decisions, depending on the business model, if a player is going to maintain physical inventories then the following screen will appear after clicking next button

#### 5.3.3.2.2 Inventory Management Policy

(Refer Chopara 208-210)

---

File Help

---

SET REVIEW PERIOD ( days ) 7

SET ( s, S ) INVENTORY POLICY FOR EACH SUBPRODUCT

CD	s	S	CASSETTE	s	S
Ghazhal	0	0	Ghazhal	0	0
Oldie	0	0	Oldie	0	0
New Release and Pop	0	0	New Release and Pop	0	0
Classical	0	0	Classical	0	0

BACK NEXT

---

Figure. 5.11

***Periodic Review Period:***

If a player maintains some physical inventories then he/she will have to decide the period length after which one will review his/her inventory status, and if there is shortage of inventories then an order will be placed to the suppliers. Too small a periodic review period may lead to increase in ordering cost and lost of opportunity to avail quantity discounts from the suppliers, whereas too large a review period may lead to shortages or increase in holding costs. Its a strategic decision, once taken, it cannot be changed for three months, therefore one must decide the periodic review period after taking into considerations all the aspects

***Set (s, S) Policy:***

Here player sets his/her (s, S) policy for different varieties both for CD and Cassettes. A player must have an idea about the market shares of different types of products and sub products that he/she is offering before deciding the (s, S) policy of each variety. S denotes the maximum level, up to which one wants to replenish the inventory, too small S may lead to backorders, whereas too large S may lead to increase in holding costs. s denotes the inventory level below which the order for that item will be triggered. The value of s should be such that it should be able to fulfill the lead time demand. Too small s may lead to backorders and too high s may lead to high holding cost. This is a very crucial decision, one must take this decision after due consideration and analysis. This decision once taken can only be modified after three months.

After taking these decisions, click on the next button, the strategic decisions menu will reappear

---

File Help

---

**WEB SITE MANAGEMENT**

☐ IN HOUSE

☐ OUT SOURCE

**ONLINE SHOP DESIGN**

**FACILITIES YOU WANT TO PROVIDE**

☐ Registration

☐ Chat with Artists

☐ Search Engine

☐ Sample Download

☐ Music Ratings

☐ Music Newsletter

**SELECT PAYMENT MODE/S**

☐ Credit Card/Debit Card

☐ Cheque/Demand Draft

☐ Cash on Delivery

**SELECT DELIVERY POLICY**

☐ Free Delivery

☐ Charged Delivery

BACK	NEXT
------	------

Figure 5.12

***Payment Modes:***

Player can choose payment mode/s he/she wants to offer his/her customers. For each payment mode, player has to some cost. For credit/debit card, he/she to buy/out source merchant account, which accepts and processes credit/debit card transactions. Each payment mode has some attributes, which are set by instructor.

For attribute, please refer to payment modes attributes in Instructor manual.

***Delivery Policy:***

Player can choose either free delivery or charged delivery policy. If one chooses "charged delivery" policy, one has to decide charges for it.

### 5.3.3.4 Option-4: Marketing

(Refer Kotler 456-481, 586-586)

After clicking on the Marketing button the following screen will appear:

File Help			
Advertising Budget per Month (in Units of Lakhs)			
0			
Set Selling Price of CD and CASSETTE			
CD		CASSETTE	
REFERENCE CD PRICE		REFERENCE CASSETTE PRICE	
Ghazhal	300.0	Ghazhal	50.0
Oldie	0.0	Oldie	0.0
New Release and Pop	0.0	New Release and Pop	0.0
Classical	0.0	Classical	0.0
BACK		NEXT	

Figure 5.13

This screen is for taking all the decisions related to the marketing mix variables.

Various fields in the screen are described below

#### **Advertising Budget:**

The player has to enter the amount of money that one is going to spend on advertising. Here player will enter the advertising budget per month for three months. The player should decide his advertising spending policy to get the optimal results. The returns of advertising will be in terms of awareness created. One of the general phenomena of advertising spending is that with increase in advertising there are decreasing returns and also there is also some delayed or carryover effects of advertising. Also it may be possible that the competitors are also doing heavy advertising so the effectiveness of advertising may decrease. So a player should keep in mind these things while deciding his advertising spending policy.

#### **Pricing Policy:**

Here the player decides the MRP (Maximum Retail Price) of different items offered. The reference price set



by the instructor will be displayed to the player, the player has to decide his/her pricing policy with respect to the reference price set by the instructor. While setting the prices, one must keep in mind the potential population to which one is targeting.

After taking these decisions, click on the next button, the following screen will appear:

File Help			
<b>DELIVERY TYPE</b>		<b>Reference Cost</b>	<b>Delivery Charge</b>
Normal Delivery (Rs./Item)		5.0	5.0
Express Delivery (Rs./Item)		10.0	10.0
Cash on Delivery (%Of Total Cost)		10.0	10.0
<b>PLAYER'S CONTRACT WITH COURIER</b>			
<b>DELIVERY TYPE</b>	<b>Up to Number of Items</b>	<b>Rs./Item</b>	<b>Incremental(Rs./Item)</b>
Normal Delivery	100	4.0	3.0
Express Delivery	100	8.0	5.0
Cash on Delivery (%Of Total Cost)	5.0		
<div>BACK</div> <div>NEXT</div>			

Figure 5.14

***Delivery Policy:***

Here the player will decide about the prices that he/she is going to charge the customer, the reference price set up by the instructor will be displayed to the player. The delivery charges will have impact on the conversion rate and the average quantity purchased by the customers.

### 5.3.3.5 Option-5: Operational Decisions

After taking all the strategic decisions, i.e. the decisions that a player can change only after three months, now its time to take operational decisions. These decisions player can change after every review period. This screen will be displayed to the player after every review period. The types of decisions and the reports that a player

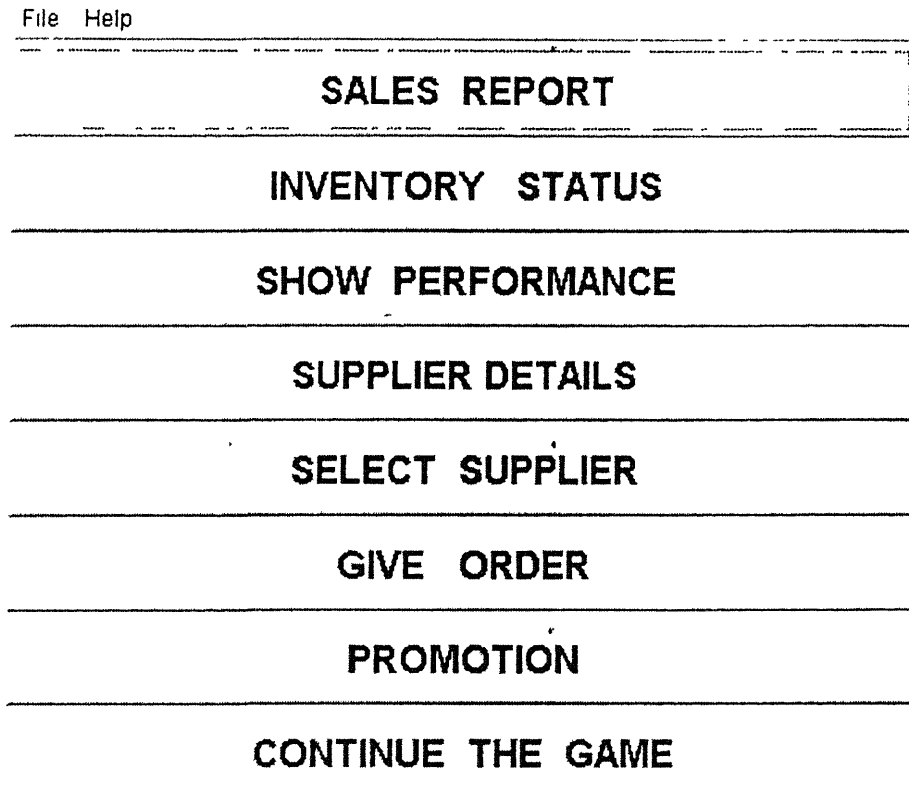


Figure. 5.15

<b>Purpose:</b>	This module is to be used by the player to view review period results and take operational decisions regarding selection of supplier, placing an order etc
<b>When to Use:</b>	Use by the players after each review period
<b>Instructions:</b>	Fill all the fields, don't skip any field. The menu will let one specify the following

#### **5.3.3.5.1 Option-1 (Sales Report)**

After clicking on the sales report button, the sales report of the past period will be produced. The report shows demand and sales of each item offered by the player in the past week.

#### **5.3.3.5.2 Option-2 (Inventory Status Report)**

After clicking on the inventory status report, the inventory status of each item in each warehouse will be produced. It will help the player in accessing the inventory status and deciding the ordering size.

#### **5.3.3.5.3 Option-3 (Show Results)**

After clicking on the show results button, a table will be generated displaying the following results of the last period:

- Number of hits on the site
- Number of new customers arrived.
- Number of repeat customers arrived
- Number of orders completely fulfilled
- Number of orders partially fulfilled
- Number of orders delayed
- Number of orders cancelled
- Amount paid to the supplier in last period
- Amount payable to the supplier.
- Amount paid to the courier agency in last period
- Amount payable to the courier agency
- Overheads and interest paid in last period
- Overheads and interest payable.
- Revenues in current period
- Cash in hand
- Amount receivable
- Lost sales in last period
- Total defaulters in last period
- Total default amount
- Fill rate

As it can be seen from the long list, a large number of performance measuring variables are displayed to the player at the end of each review period, to help him/her in taking wise decisions

#### 5.3.3.5.4 Option-4 (See Supplier Details)

After clicking on the see supplier details button, a table will be generated displaying the attributes of the different suppliers available. A list of suppliers table is provided to the player to choose the supplier from the list, the suppliers are differentiated based on some attributes that are explained in the instructor setup

#### 5.3.3.5.5 Option-5 (Select Supplier)

After clicking on the select supplier button, the following screen will appear

File Help

☐ SEQUENTIALLY

☐ LESSER LEAD TIME

☐ MORE RELIABLE SUPPLIER

☐ I WILL PREFER TO CHOOSE SUPPLIER NUMBER MYSELF

Figure 5.16

Figure 5 16

As the screen is self explanatory, it helps the player to choose supplier on the basis of

- Based on sequence number
- Least lead time
- Reliability
- Choose the supplier yourself

### 5.3.3.5.6 Option-6 (Give Order)

After clicking on the give order button, a table will be generated displaying the order placed to each supplier for each warehouse and for each item. This table is editable, that means the player can modify the order based on his/her requirements or to avail quantity discounts.

### 5.3.3.5.7 Option-7 (Promotion)

(Refer Kotler 597-605, Gilbert 127-128)

After clicking on the promotion button, the following screen will appear:

NEW CUSTOMER PROMOTION POLICY	
<b>CD</b>	
<input type="radio"/> Ghazal	No new promotion
<input type="radio"/> Classical	No new promotion
<input type="radio"/> Oldie	No new promotion
<input type="radio"/> New Release and Pop	No new promotion
<b>CASSETTE</b>	
<input type="radio"/> Ghazal	No new promotion
<input type="radio"/> Classical	No new promotion
<input type="radio"/> Oldie	No new promotion
<input type="radio"/> New Release and Pop	No new promotion
<input type="button" value="BACK"/> <input type="button" value="NEXT"/>	

Figure 5.17

**New Customer Promotion Policy:** The player has to decide promotion that he/she is offering on each category of product to new customers. It's an operational level decision and can be changed after each review period. Promotion has impact on conversion rate, purchase probability of items on which the promotion is offered and no. of quantity purchased by customers. A player must keep in mind that it may be possible that competitors are also offering

promotions, so that the effectiveness of the promotion may decrease.

After taking these decisions, click on the next button, the screen given on the next page will appear

File Help	
<b>REPEAT CUSTOMER PROMOTION POLICY</b>	
<b>CD</b>	
<input type="radio"/> Ghazal	No Promotion
<input type="radio"/> Classical	No Promotion
<input type="radio"/> Oldie	No Promotion
<input type="radio"/> New Release and Pop	No Promotion
<b>CASSETTE</b>	
<input type="radio"/> Ghazal	No Promotion
<input type="radio"/> Classical	No Promotion
<input type="radio"/> Oldie	No Promotion
<input type="radio"/> New Release and Pop	No Promotion
<b>BACK</b>	<b>NEXT</b>

Figure: 5.18

**Repeat Customer Promotion Policy:** The player has to decide promotion that he/she is offering on each category of product to repeat customers. It's an operational level decision and can be changed after each review period. Promotion has impact on arrival rate of repeat customers, purchase probability of items on which the promotion is offered and no of quantity purchased by customers. A player must keep in mind that it may be possible that competitors are also offering promotions, so that the effectiveness of the promotion may decrease.

#### 5.3.3.5.8 Option-8 (Continue Simulation)

Before clicking this button the player should check all the decisions that he/she is taken After checking the decisions click on this button to run the simulation for the review period. After the end of simulation the operation decision screen will reappear

#### 5.3.4 Quarterly Results (option 3 on the main MENU screen)

These results will be available to the players in every three months in between the game These results indicate the overall performance of the player in terms of various index and profit and loss account

Quarterly results were given in two reports

- Overall Performance Report It contains various indexes denoting the overall performance of the player
  - Profit and Loss account
- ✓ **Overall Performance Report:** It contains the following indexes and numbers
1. Total number of hits on the site.
  2. Total number of new customers
  3. Total number of repeat customers
  4. Total number of orders completely fulfilled
  5. Total number of orders partially fulfilled
  6. Total number of orders cancelled

All the above numbers are self explanatory; the other indexes that are provided in the table are described below

**Fill Rate:** It is the fraction of product demand that is satisfied from the product in inventory It is equivalent to the probability that the product demand is supplied from the available inventory It's a measure of inventory performance

**Inventory turn over ratio:** Inventory turn over ratio is another measure on inventory performance, It is the ratio of annual sales to the average inventory investment per annum All else being equal, a higher number is preferred, indicating

	that inventory moves through the firm's operations quickly, rather than being held for an extensive period.
<b><i>Awareness index:</i></b>	It is a measure of the effectiveness of advertising in creating awareness in the potential population. Its value ranges between 0-1.0, low value denoting poor performance in terms of ability of the firm in creating awareness about its product among the potential population
<b><i>Site adoption rate:</i></b>	It is a measure of the ability of the firm to attract the peoples on the site. Its value ranges between 0-1.0, low value denoting poor performance in terms of ability to attract customers on the site.
<b><i>Conversion Rate:</i></b>	It is a measure of the ability of the firm to convert the people arrived on the site into potential customers. Its value ranges between 0-1.0, low value denoting poor performance in terms of ability of the firm to convert people arriving at site into customers.
<b><i>Customer Service Index:</i></b>	It is a measure of ability of the firm in fulfilling customer's orders on time. Its value ranges between 0.0-1.0, low value denoting poor performance in terms of customer service and vice versa. It affects on the arrival rate of repeat customers.
<b><i>CD Pricing Index:</i></b>	It is a measure of the impact of CD pricing policy of the firm on the size of potential population targeted. Its value ranges between 0-1.0, low value denoting poor performance in terms of pricing policy and hence poor ability to attract large number of customers
<b><i>Cassette Pricing Index:</i></b>	It is a measure of the impact of Cassette pricing policy of the firm on the size of potential population targeted. Its value ranges between 0-1.0, low value denoting poor performance in terms of pricing policy and hence poor ability to attract large number of customers.
<b><i>Delivery Pricing Index:</i></b>	It is a measure of the impact of delivery policy on the customer arrival rate. Its value ranges between 0-1.0,



low value denoting poor performance in terms of delivery pricing policy and hence poor ability to attract large number of customers

***Site Design Index:***

It is a measure of ability of the firm in designing and maintaining site. A good site design will attract large number of customers. Its value ranges between 0-1.0, low value denoting poor performance in terms of site designing

All these indexes help a firm as well as instructor in judging the performance of the firms

- ✓ ***Profit and Loss Account:*** The profit and loss account is provided to the player in every three months, to access his/her financial position. The P&F is self explanatory, indicating various expenses and revenues incurred in the last quarter

## **5.4 Concluding the Game and Grading**

### **5.4.1 Final Presentation by Players**

After the last period's results are returned to the firms, the learning experience can be extended by some post-game analysis by both the students and the instructor. The end of the game is an ideal time for the firms to recap and access their business strategies. Although this can be done as either a written assignment or a class presentation, latter can be beneficial. Class presentations give firms an opportunity both to listen to their competitors and to question them. Not only do student like the chance to talk with other firms, but knowing they must respond to questions from competitors to be thorough and honest in their post-game assessments

### **5.4.2 Final Wrap-Up by the Instructor**

In addition to reports by the individual firms, the instructor may want to summarize player's performances. Summarizing the performances of the players can demonstrate how firms, which all started at the same position, have evolved differently as a result of their decisions. There may be many contrasts, two companies having comparable profits but seemingly different strategies. In one case profits may have resulted from

relatively higher margins and lower unit sales volumes, compared with the second case of lower margins coupled with higher unit sales volumes.

### **5.4.3 Evaluating Student Performance in the Game**

There are many different ways to evaluate student performance in the game and what is best depend on one's preference and objectives. Thus, there is no "idle" approach to grading. However we are providing a few ideas that may help the instructor on deciding what approach one should use.

#### **✓ Use Profit as a Measure**

Some instructors like to anchor grades in the game, at least partly, on how much profit a firm has earned over time. There are both advantages and limitations to this approach. From a practical standpoint, one advantage is that it provides a quantitative summary measure of performance. After all, most businesses point to the "bottom line" as a measure of success. On the other hand, simply rank-ordering firms on profit contribution may disregard much information- how much improvement there has been, how well positioned the firm is at the end of the game to earn future profits, and the like.

#### **✓ Use Quality of the Strategy as a Measure**

Another approach is to assign a grade to the quality of a firm's strategic decisions. Here, the focus is not just on the profit earned but also on the consistency of the strategy and how logical it appeared to be at the time. A good way to do this is to set up a chart at the beginning of the game- where each firm is a row in the chart and each decision period is a column. Then, instructor can look at various reports as one run simulation each period and assign a subjective grade. For example one might grade a firm down if it sets a price that isn't even high enough to cover marginal costs- says nothing about contributing to the profit or if a firm seems to have no target market and jumps around from one period to another changing decisions regarding pricing, one may grade it down.

The real advantage of keeping track period is that this avoids a too heavy reliance on memory- or the bias that may be introduced by a strong performance right at the end.

Of course, even if one score decisions over time one can weight them differently in arriving at a composite grade for this aspect of performance.

✓ **Take Average of Performance Measuring Indexes**

One of the simple ways of grading is to combine all the performance measuring indexes provided at the end of the simulation reports into an overall grade. This can be done qualitatively, or you can give each component of performance its own grade and then developed an average- perhaps weighting the most important components more heavily

## Chapter 6: Conclusion

### 6.1 Conclusions

E- Commerce evolved as successful business practice in this internet era. Due to proliferation of internet, the birth of virtual companies has been surging. E – Commerce has become survival strategy for many existing companies. And ultimately Customers are gaining in terms of products assortments, customer service, ambience, price, etc. But, there are several issues that one must keep in mind before opting for online business. From the customer's perspective, there are costs as well as benefits associated with new technologies. They often are confusing, take time to learn, are prone to failure, and can raise the prices of goods and services whereas from the traders perspective, technology is expensive to adopt and maintain and can become obsolete quickly. Due to these complications, during the past year, a number of high-flying companies hit hard times such as Toysmart.com and Living.com, but at the same time, the success of Amazon.com, Dell computers, eBay and others served as a wakeup call for many executives.

The objective of this work was to design a simulation tool to teach that new technology is creating opportunities to rethink business models, processes and relationships along the whole length of the supply chain in pursuit of unprecedented levels of productivity, improved customer propositions and new streams of business. This game can also be used as a decision support system to executives of companies, which have presence online or which are planning to go online.

To fully realize the great potential of multi-channel retailing, companies must offer an exceptional customer experience. Customers have very high expectations online — just as they do on-land — and their loyalty is very conditional. Success will depend on having a brand that enables them to meet and exceed customer expectations and improve the customer relationship.

## 6.2 Limitations of the Simulation Game

There are various limitations of the simulation game that we developed, some are due to time constraints while some are due to unavailability of good models in e-commerce due to the shortage of established theories in this field. One of the most important objective of this game is to provide easy learning and to fulfill this; some constraints are deliberately included in the game

- The game is developed for retailing of only music products i.e. Cassettes and CD's to avoid complexity in designing the game.
- The customization of music products is not included in the game due to programming limitations. Customization of music products is becoming easy due to internet.
- The number of varieties and the number of warehouses that a player can maintain are limited to small numbers to provide easy learning.
- Due to lack of a demand model in literature, that can accommodate all the online marketing mix variables, a simple demand model which accommodates advertising, pricing and word of mouth effect is included in the game.
- Due to lack of model for online promotions, simple price promotion policy is used for individual product. We couldn't use any Reward points and bundling of products, which are very common in online retailing.
- We have assumed all consumers are homogeneous, all behave in same fashion.
- Only (s, S) policy is provided in the game for inventory management, EOQ policy is deliberately excluded from the game to provide easy learning.
- One of the major limitations of the game is its lack of accommodations of different firms in the same market. The game is designed to be played by only one team and there is no competition among the players to capture the market share.

### 6.3 Directions for Future Work

- This game can be played by single player, but in future it can be designed in such way that many players can play simultaneously to create competition
- We have used homogeneous consumer market, but in reality each consumer behaves in unique way, his/her needs are different, their purchase power largely depends on their income, their hobbies are different etc. Hence, consumer segmentation can be included
- In this game, products are Music CDs and Cassettes, which are one of top selling products on internet. Virtual music product like MP3 songs can be added in future work. Also some other products like grocery products, PC, Apparels etc can be added
- Mass customization has evolved as a compelling business proposition for companies who aim to address individual needs of customer. In last few years, proliferation of Internet as medium of information exchange has provided these companies with an effective tool to implement product customization. Customization part must be added.
- A significant extension to this game will be marketing aspects of online retailing. We have used limited marketing principles due to unavailability of models. All 4 Ps (Product, Price, Promotion, and Place) of marketing in detail should be addressed
- Research reports such as marketing reports, demand forecast reports can be added
- Supplier and Carrier policy can be further developed

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## Appendix A1

### A1.1 Sample Run of the Simulation Game

In this section, a sample run of the simulation game is described. The game is played as per the instructions given in the manual of the game, given in chapter 5.

#### Instructor Setup:

Various parameters that the instructor is supposed to set are set and the values are given in table

Market Environment Setup. Given in table A1.1

Delivery Policy Set up. Given in table A1.2

Site design cost setup: Given in table A1.2

After the instructor Setup, various decisions/variables that are supposed to be taken by the player, are set and the values are given in table

Finance and Supply Chain Selection. Given in table A1.3

Product Selection. Given in table A1.4

Inventory Management Policy. Given in table A1.5

Marketing. Given in table A1.6

Retail Shop Design. Given in table A1.7

Operational Decisions

After setting all the decision parameters, the game is made to run for a period of three months. The results obtained are shown in the following tables.

#### Period 1:

New customer Promotion Policy. table A1.8

Repeat customer Promotion Policy. table A1.9

Supplier Selection. table A1.10

Sales results. table A1.11

Inventory Status. table A1.12

Other Results. table A1.13

#### Period 2:

New customer Promotion Policy. table A1.14

Repeat customer Promotion Policy. table A1.15

Supplier Selection. table A1.16

Sales results. table A1.17

Inventory Status. table A1.18

Other Results. table A1.19

#### Period 3:

New customer Promotion Policy. table A1.20

Repeat customer Promotion Policy. table A1.21

Supplier Selection. table A1.22

Sales results. table A1.23

Inventory Status. table A1.24



**Table A1.1: Instructor Set Up-1**

Instructor Set Up-1	
Market Potential	50,000,00
Advertising Effectiveness	High
Promotion Effectiveness	High
% CD Market	5%
% Cassette Market	95%
CD Reference Price	300
Cassette Reference Price	60
Weight age	
Impact of Delivery Policy	40
On New Customer	
Impact of Product Range	40
Impact of Promotion	80
Repeat customer	
Impact of Product Range	50
Impact of Promotion	60
Impact of Customer service Level	80
Inventory Related Costs	
Order Cost	500
Incremental Costs	1
Holding Cost in % of Inventory Value	20
Finance	
Maximum Loan Amount	1,00,000,00
Interest Rate	12%

**Table A1.2: Instructor Set Up-2**

Instructor Set Up-2	
Delivery related Costs	
Normal Delivery reference cost	5
Express Delivery reference Costs	10
Contract	
Normal Delivery	4 Rs upto 100 orders/day + 3 Rs incremental
Express Delivery	8 Rs upto 100 orders/day + 5 Rs incremental
Total Web Outsourcing Costs	
Domain Name Costs	
Web Hosting Costs	
Hardware Costs	
Shopping Cart Costs	
Payment Gateway Costs	
Total Monthly Cost for above Facilities	10000
Other Facilities Cost/month	
Registration	5000
chat room	7500
search Engine	2500
Sample Music Download	10000

Music Rating	8000
Music Newsletters	14000
Warehouse Maintenance costs/month	15000

**Table A1.3: Financial and Supply Chain Decisions**

Financial Decisions	
Loan Taken in Current Period	20,000,00
Loan Repayment	0
Supply Chain	
Online In-house	Selected
No. of Warehouses	2
Online Outsource single order passing	Not Selected
Online Outsource clubbing of orders	Not Selected
Order Period	
Online and Offline	Not Selected
No. of Locations	

**Table A1.4: Product Selection:**

Product Selection	
	Number of Varieties
CD Ghazal	2
CD Oldie	5
CD new pop	5
CD Classical	2
Cassette Ghazal	2
Cassette Oldie	5
Cassette new pop	5
Cassette Classical	2



**Table A1.5: Inventory Management Policy:**

Inventory Management Policy		
Set Review Period Length		15
Set (s, S) Policy	s	S
CD Ghajal	40	100
CD Oldie	100	300
CD new pop	100	300
CD Classical	40	100
Cassette Ghajal	50	200
Cassette Oldie	100	500
Cassette new pop	100	500
Cassette Classical	50	300

**Table A1.6: Marketing Decisions:**

Marketing	
Advertising Budget in lakhs/month	2
Set Selling Price	
CD Ghajal	330
CD Oldie	310
CD new pop	350
CD Classical	300
Cassette Ghajal	65
Cassette Oldie	56
Cassette new pop	65
Cassette Classical	62
Set Delivery Charges	
Normal (Rs/Item)	5
Express (Rs/Item)	10

**Table A1.7: Retail Shop Design:**

Retail Shop Design	
In-house	Not Selected
Outsource	Selected
Web Facilities	
Registration	Selected
chat room	Selected
search Engine	Selected
Sample Music Download	Not Selected
Music Rating	Not Selected
Music Newsletters	Not Selected
Select Payment Mode	Selected
Credit/debit	Selected
Cheque/DD	Selected
COD	
Select delivery Policy	
Free	Not Selected
Charged	Selected

## Operational Decisions

**Table A1.8: Promotion for new Customer (Period 1):**

Promotion for new Customer	
CD Ghajal	Not Selected
CD Oldie	Not Selected
CD new pop	Not Selected
CD Classical	Not Selected
Cassette Ghajal	Not Selected
Cassette Oldie	Not Selected
Cassette new pop	Not Selected
Cassette Classical	Not Selected

**Table A1.9: Promotion for repeat Customer (Period 1):**

Promotion for repeat Customer	
CD Ghazal	Not Selected
CD Oldie	Not Selected
CD new pop	Not Selected
CD Classical	Not Selected
Cassette Ghazal	Not Selected
Cassette Oldie	Not Selected
Cassette new pop	Not Selected
Cassette Classical	Not Selected

**Table A1.10: Select Supplier (Period 1):**

Select Supplier	
Less Lead Time	Selected
More Reliable	Not Selected
Sequentially	Not Selected
Chose Yourself	Not Selected

Results at the end of First Period

**Table A1.11: Sales Report (Period-1)**

Product	Sub Product	Variety No	Demand	Sales
CD	Ghazal	1	30	29
CD	Ghazal	2	23	18
CD	Ghazal	3	0	0
CD	Ghazal	4	0	0
CD	Ghazal	5	0	0
CD	Oldie	1	15	14
CD	Oldie	2	19	17
CD	Oldie	3	10	8
CD	Oldie	4	9	8
CD	Oldie	5	4	3
CD	New Pop	1	44	40
CD	New Pop	2	79	71
CD	New Pop	3	54	42
CD	NewPop	4	37	30
CD	NewPop	5	11	10
CD	Classical	1	1	1
CD	Classical	2	2	2
CD	Classical	3	0	0
CD	Classical	4	0	0
CD	Classical	5	0	0
Cassette	Ghazal	1	353	304
Cassette	Ghazal	2	341	302
Cassette	Ghazal	3	0	0
Cassette	Ghazal	4	0	0
Cassette	Ghazal	5	0	0
Cassette	Oldie	1	179	160
Cassette	Oldie	2	281	246

Cassette	Oldie	3	261	226
Cassette	Oldie	4	130	119
Cassette	Oldie	5	30	26
Cassette	NewPop	1	794	677
Cassette	NewPop	2	1190	1000
Cassette	NewPop	3	1061	934
Cassette	NewPop	4	599	525
Cassette	NewPop	5	131	115
Cassette	Classical	1	32	31
Cassette	Classical	2	28	23
Cassette	Classical	3	0	0
Cassette	Classical	4	0	0
Cassette	Classical	5	0	0

Table A1.12: Inventory Status (Period-1)

Wh No	Product	Sub Product	variety	inventory
1	CD	Ghazal	1	85
1	CD	Ghazal	2	90
1	CD	Ghazal	3	0
1	CD	Ghazal	4	0
1	CD	Ghazal	5	0
1	CD	Oldie	1	290
1	CD	Oldie	2	293
1	CD	Oldie	3	295
1	CD	Oldie	4	297
1	CD	Oldie	5	299
1	CD	New Pop	1	280
1	CD	New Pop	2	259
1	CD	New Pop	3	276
1	CD	New Pop	4	282
1	CD	New Pop	5	292
1	CD	Classical	1	99
1	CD	Classical	2	99
1	CD	Classical	3	0
1	CD	Classical	4	0
1	CD	Classical	5	0
1	Cassette	Ghazal	1	24
1	Cassette	Ghazal	2	29
1	Cassette	Ghazal	3	0
1	Cassette	Ghazal	4	0
1	Cassette	Ghazal	5	0
1	Cassette	Oldie	1	407
1	Cassette	Oldie	2	364
1	Cassette	Oldie	3	360
1	Cassette	Oldie	4	419
1	Cassette	Oldie	5	485
1	Cassette	New Pop	1	99
1	Cassette	New Pop	2	0
1	Cassette	New Pop	3	0
1	Cassette	New Pop	4	187
1	Cassette	New Pop	5	440
1	Cassette	Classical	1	285
1	Cassette	Classical	2	285

1	Cassette	Classical	3	0
1	Cassette	Classical	4	0
1	Cassette	Classical	5	0
2	CD	Chazal	1	86
2	CD	Ghazal	2	92
2	CD	Ghazal	3	0
2	CD	Ghazal	4	0
2	CD	Ghazal	5	0
2	CD	Oldie	1	296
2	CD	Oldie	2	290
2	CD	Oldie	3	297
2	CD	Oldie	4	295
2	CD	Oldie	5	298
2	CD	New Pop	1	280
2	CD	New Pop	2	270
2	CD	New Pop	3	282
2	CD	New Pop	4	288
2	CD	New Pop	5	298
2	CD	Classical	1	100
2	CD	Classical	2	99
2	CD	Classical	3	0
2	CD	Classical	4	0
2	CD	Classical	5	0
2	Cassette	Ghazal	1	58
2	Cassette	Ghazal	2	54
2	Cassette	Ghazal	3	0
2	Cassette	Ghazal	4	0
2	Cassette	Ghazal	5	0
2	Cassette	Oldie	1	422
2	Cassette	Oldie	2	378
2	Cassette	Oldie	3	399
2	Cassette	Oldie	4	457
2	Cassette	Oldie	5	488
2	Cassette	New Pop	1	177
2	Cassette	New Pop	2	0
2	Cassette	New Pop	3	45
2	Cassette	New Pop	4	265
2	Cassette	New Pop	5	437
2	Cassette	Classical	1	284
2	Cassette	Classical	2	291
2	Cassette	Classical	3	0
2	Cassette	Classical	4	0
2	Cassette	Classical	5	0

Table A1.13: Other Results (Period-1)

Result	Data
NUMBER OF HITS ON THE SITE PER WEEK	6320
NUMBER OF NEW CUSTOMERS IN CURRENT PERIOD	1985
NUMBER OF REPLACED CUSTOMERS IN CURRENT PERIOD	37
NUMBER OF ORDERS COMPLETELY FULFILLED	1782
NUMBER OF ORDERS PARTIALLY FULFILLED	2
NUMBER OF ORDERS CANCELLED	156
REVENUES IN CURRENT PERIOD	436066.9

AMOUNT PAID TO SUPPLERS	0
AMOUNT PAYABLE TO SUPPLIERS	1820200
AMOUNT PAID TO COURIER	17929
AMOUNT PAYABLE TO COURIER	0
OVERHEAD, INTEREST, SALARY, AND MAINTAINENCE COST PAID	285000
OVERHEAD, INTEREST, SALARY, AND MAINTAINENCE COST PAYABLE	0
CASH IN HAND	1863515
AMOUNT RECEIVABLE	258060 5
LOST SALES IN CURRENT PERIOD	46174 2
NO OF DEFAULTERS	32
TOTAL DEFAULT AMOUNTS	7548
FILL RATE	0 734516

**Period: 2**

**Table A1.14: Promotion for new Customer (Period-2)**

Promotion for new Customer	
CD Ghajal	Not Selected
CD Oldie	Not Selected
CD new pop	Not Selected
CD Classical	Selected
Cassette Ghajal	Not Selected
Cassette Oldie	Not Selected
Cassette new pop	Not Selected
Cassette Classical	Selected

**Table A1.15: Promotion for repeat Customer (Period-2)**

Promotion for repeat Customer	
CD Ghazal	Not Selected
CD Oldie	Not Selected
CD new pop	Not Selected
CD Classical	Selected
Cassette Ghazal	Not Selected
Cassette Oldie	Not Selected
Cassette new pop	Not Selected
Cassette Classical	Selected

**Table A1.16: Select Supplier (Period 2):**

Select Supplier	
Less Lead Time	Not Selected
More Reliable	Selected
Sequentially	Not Selected
Chose Yourself	Not Selected

**Table A1.17: Sales Report (Period-2)**

Product	Sub Product	Variety No	Demand	Sales
CD	Ghazal	1	25	25
CD	Ghazal	2	30	30
CD	Ghazal	3	0	0
CD	Ghazal	4	0	0
CD	Ghazal	5	0	0
CD	Oldie	1	16	16
CD	Oldie	2	23	23
CD	Oldie	3	23	23
CD	Oldie	4	16	16
CD	Oldie	5	3	3
CD	NewPop	1	67	67
CD	NewPop	2	97	97
CD	NewPop	3	85	85
CD	NewPop	4	49	49
CD	NewPop	5	9	9
CD	Classical	1	2	2
CD	Classical	2	5	5
CD	Classical	3	0	0
CD	Classical	4	0	0
CD	Classical	5	0	0
Cassette	Ghazal	1	517	281
Cassette	Ghazal	2	528	271
Cassette	Ghazal	3	0	0
Cassette	Ghazal	4	0	0
Cassette	Ghazal	5	0	0
Cassette	Oldie	1	262	220

Cassette	Oldie	2	393	301
Cassette	Oldie	3	436	338
Cassette	Oldie	4	216	161
Cassette	Oldie	5	58	45
Cassette	NewPop	1	1165	760
Cassette	NewPop	2	1856	1022
Cassette	NewPop	3	1600	1063
Cassette	NewPop	4	884	483
Cassette	NewPop	5	234	182
Cassette	Classical	1	36	26
Cassette	Classical	2	48	36
Cassette	Classical	3	0	0
Cassette	Classical	4	0	0
Cassette	Classical	5	0	0

Table A1.18: Inventory Status (Period-2)

Wh No	Product	Sub Product	variety	inventory
1	CD	Ghazal	1	70
1	CD	Ghazal	2	76
1	CD	Ghazal	3	0
1	CD	Ghazal	4	0
1	CD	Ghazal	5	0
1	CD	Oldie	1	281
1	CD	Oldie	2	282
1	CD	Oldie	3	277
1	CD	Oldie	4	288
1	CD	Oldie	5	298
1	CD	NewPop	1	243
1	CD	NewPop	2	211
1	CD	NewPop	3	236
1	CD	NewPop	4	257
1	CD	NewPop	5	287
1	CD	Classical	1	98
1	CD	Classical	2	98
1	CD	Classical	3	0
1	CD	Classical	4	0
1	CD	Classical	5	0
1	Cassette	Ghazal	1	0
1	Cassette	Ghazal	2	0
1	Cassette	Ghazal	3	0
1	Cassette	Ghazal	4	0
1	Cassette	Ghazal	5	0
1	Cassette	Oldie	1	279
1	Cassette	Oldie	2	196
1	Cassette	Oldie	3	153
1	Cassette	Oldie	4	317
1	Cassette	Oldie	5	465
1	Cassette	NewPop	1	0
1	Cassette	NewPop	2	0
1	Cassette	NewPop	3	0
1	Cassette	NewPop	4	0



1	Cassette	NewPop	5	339
1	Cassette	Classical	1	273
1	Cassette	Classical	2	258
1	Cassette	Classical	3	0
1	Cassette	Classical	4	0
1	Cassette	Classical	5	0
2	CD	Ghazal	1	76
2	CD	Ghazal	2	76
2	CD	Ghazal	3	0
2	CD	Ghazal	4	0
2	CD	Ghazal	5	0
2	CD	Oldie	1	289
2	CD	Oldie	2	278
2	CD	Oldie	3	292
2	CD	Oldie	4	288
2	CD	Oldie	5	296
2	CD	NewPop	1	250
2	CD	NewPop	2	221
2	CD	NewPop	3	237
2	CD	NewPop	4	264
2	CD	NewPop	5	294
2	CD	Classical	1	99
2	CD	Classical	2	95
2	CD	Classical	3	0
2	CD	Classical	4	0
2	CD	Classical	5	0
2	Cassette	Ghazal	1	0
2	Cassette	Ghazal	2	0
2	Cassette	Ghazal	3	0
2	Cassette	Ghazal	4	0
2	Cassette	Ghazal	5	0
2	Cassette	Oldie	1	328
2	Cassette	Oldie	2	229
2	Cassette	Oldie	3	243
2	Cassette	Oldie	4	387
2	Cassette	Oldie	5	459
2	Cassette	NewPop	1	0
2	Cassette	NewPop	2	0
2	Cassette	NewPop	3	0
2	Cassette	NewPop	4	0
2	Cassette	NewPop	5	344
2	Cassette	Classical	1	270
2	Cassette	Classical	2	280
2	Cassette	Classical	3	0
2	Cassette	Classical	4	0
2	Cassette	Classical	5	0

**Table A1.19: Other Results (Period-2)**

Result	Data
NUMBER OF HITS ON THE SITE PER WEEK	5985
NUMBER OF NEW CUSTOMERS IN CURRENT PERIOD	2955
NUMBER OF REPEAT CUSTOMERS IN CURRENT PERIOD	236
NUMBER OF ORDERS COMPLETELY FULFILLED	1998
NUMBER OF ORDERS PARTIALLY FULFILLED	460
NUMBER OF ORDERS CANCELLED	713
REVENUES IN CURRENT PERIOD	522929 6
AMOUNT PAID TO SUPPLERS	1820200
AMOUNT PAYABLE TO SUPPLIERS	100551 6
AMOUNT PAID TO COURIER	24489
AMOUNT PAYABLE TO COURIER	0
OVERHEAD INTEREST, SALARY AND MAINTAINENCE COST PAID	305000
OVERHEAD INTEREST, SALARY AND MAINTAINENCE COST PAYABLE	0
CASH IN HAND	173108 8
AMOUNT RECEIVABLE	281035 8
LOST SALES IN CURRENT PERIOD	148787 1
NO OF DEFAULTERS	42
TOTAL DEFAULT AMOUNTS	14387
FILL RATE	0 63717

**Period: 2****Table A1.20: Promotion for new Customer (Period-3)**

Promotion for new Customer	
CD Ghajal	Selected
CD Oldie	Not Selected
CD new pop	Not Selected
CD Classical	Not Selected
Cassette Ghajal	Selected
Cassette Oldie	Not Selected
Cassette new pop	Not Selected
Cassette Classical	Not Selected

**Table A1.21: Promotion for repeat Customer (Period-3)**

Promotion for repeat Customer	
CD Ghajal	Selected
CD Oldie	Not Selected
CD new pop	Not Selected
CD Classical	Not Selected
Cassette Ghajal	Selected
Cassette Oldie	Not Selected
Cassette new pop	Not Selected
Cassette Classical	Not Selected

**Table A1.22: Select Supplier (Period 3):**

Select Supplier	
Less Lead Time	Selected
More Reliable	Not Selected
Sequentially	Not Selected
Chose Yourself	Not Selected

**Table A1.23: Sales Report (Period-3)**

Product	Sub Product	Variety No	Demand	Sales
CD	Ghazal	1	21	21
CD	Ghazal	2	33	33
CD	Ghazal	3	0	0
CD	Ghazal	4	0	0
CD	Ghazal	5	0	0
CD	Oldie	1	7	7
CD	Oldie	2	17	17
CD	Oldie	3	35	35
CD	Oldie	4	16	16
CD	Oldie	5	5	5
CD	NewPop	1	66	66
CD	NewPop	2	109	109
CD	NewPop	3	63	63
CD	NewPop	4	61	61
CD	NewPop	5	13	13
CD	Classical	1	2	2
CD	Classical	2	3	3
CD	Classical	3	0	0
CD	Classical	4	0	0
CD	Classical	5	0	0
Cassette	Ghazal	1	572	0
Cassette	Ghazal	2	553	0
Cassette	Ghazal	3	0	0
Cassette	Ghazal	4	0	0
Cassette	Ghazal	5	0	0
Cassette	Oldie	1	282	88
Cassette	Oldie	2	471	155
Cassette	Oldie	3	414	129
Cassette	Oldie	4	228	78
Cassette	Oldie	5	50	12
Cassette	NewPop	1	1252	0
Cassette	NewPop	2	2013	0
Cassette	NewPop	3	1844	0
Cassette	NewPop	4	945	0
Cassette	NewPop	5	222	79
Cassette	Classical	1	45	10
Cassette	Classical	2	42	18
Cassette	Classical	3	0	0
Cassette	Classical	4	0	0
Cassette	Classical	5	0	0

2	CD	Oldie	3	277
2	CD	Oldie	4	276
2	CD	Oldie	5	293
2	CD	NewPop	1	224
2	CD	NewPop	2	151
2	CD	NewPop	3	205
2	CD	NewPop	4	235
2	CD	NewPop	5	286
2	CD	Classical	1	98
2	CD	Classical	2	92
2	CD	Classical	3	0
2	CD	Classical	4	0
2	CD	Classical	5	0
2	Cassette	Ghazal	1	0
2	Cassette	Ghazal	2	0
2	Cassette	Ghazal	3	0
2	Cassette	Ghazal	4	0
2	Cassette	Ghazal	5	0
2	Cassette	Oldie	1	290
2	Cassette	Oldie	2	175
2	Cassette	Oldie	3	202
2	Cassette	Oldie	4	353
2	Cassette	Oldie	5	455
2	Cassette	NewPop	1	0
2	Cassette	NewPop	2	0
2	Cassette	NewPop	3	0
2	Cassette	NewPop	4	0
2	Cassette	NewPop	5	323
2	Cassette	Classical	1	262
2	Cassette	Classical	2	274
2	Cassette	Classical	3	0
2	Cassette	Classical	4	0
2	Cassette	Classical	5	0

Table A1.25: Other Results (Period-4)

Result	Data
NUMBER OF HITS ON THE SITE PER WEEK	8977
NUMBER OF NEW CUSTOMERS IN CURRENT PERIOD	3085
NUMBER OF REPEAT CUSTOMERS IN CURRENT PERIOD	662
NUMBER OF ORDERS COMPLETELY FULFILLED	546
NUMBER OF ORDERS PARTIALLY FULFILLED	122
NUMBER OF ORDERS CANCELLED	2946
REVENUES IN CURRENT PERIOD	196588 9
AMOUNT PAID TO SUPPLIERS	100551 6
AMOUNT PAYABLE TO SUPPLIERS	0
AMOUNT PAID TO COURIER	4424
AMOUNT PAYABLE TO COURIER	0
OVERHEAD, INTEREST, SALARY, AND MAINTAINENCE COST PAID	0
OVERHEAD, INTEREST, SALARY, AND MAINTAINFNCE COST PAYABLE	0
CASH IN HAND	372334 3
AMOUNT RECEIVABLE	106057 3

2	CD	Oldie	3	277
2	CD	Oldie	4	276
2	CD	Oldie	5	293
2	CD	NewPop	1	224
2	CD	NewPop	2	151
2	CD	NewPop	3	205
2	CD	NewPop	4	235
2	CD	NewPop	5	286
2	CD	Classical	1	98
2	CD	Classical	2	92
2	CD	Classical	3	0
2	CD	Classical	4	0
2	CD	Classical	5	0
2	Cassette	Ghazal	1	0
2	Cassette	Ghazal	2	0
2	Cassette	Ghazal	3	0
2	Cassette	Ghazal	4	0
2	Cassette	Ghazal	5	0
2	Cassette	Oldie	1	290
2	Cassette	Oldie	2	175
2	Cassette	Oldie	3	202
2	Cassette	Oldie	4	353
2	Cassette	Oldie	5	455
2	Cassette	NewPop	1	0
2	Cassette	NewPop	2	0
2	Cassette	NewPop	3	0
2	Cassette	NewPop	4	0
2	Cassette	NewPop	5	323
2	Cassette	Classical	1	262
2	Cassette	Classical	2	274
2	Cassette	Classical	3	0
2	Cassette	Classical	4	0
2	Cassette	Classical	5	0

Table A1.25: Other Results (Period-4)

Result	Data
NUMBER OF HITS ON THE SITE PER WEEK	8977
NUMBER OF NEW CUSTOMERS IN CURRENT PERIOD	3085
NUMBER OF REPEAT CUSTOMERS IN CURRENT PERIOD	662
NUMBER OF ORDERS COMPLETELY FULFILLED	546
NUMBER OF ORDERS PARTIALLY FULFILLED	122
NUMBER OF ORDERS CANCELLED	2946
REVENUES IN CURRENT PERIOD	196588 9
AMOUNT PAID TO SUPPLERS	100551 6
AMOUNT PAYABLE TO SUPPLIERS	0
AMOUNT PAID TO COURIER	4424
AMOUNT PAYABLE TO COURIER	0
OVERHEAD, INTEREST, SALARY,AND MAINTAINENCE COST PAID	0
OVERHEAD, INTEREST, SALARY,AND MAINTAINENCE COST PAYABLE	0
CASH IN HAND	372334 3
AMOUNT RECEIVABLE	106057 3

LOST SALES IN CURRENT PERIOD	555788.5
NO OF DEFAULTERS	23
TOTAL DEFAULT AMOUNTS	5035
FILL RATE	0.468486

**Table A1.26: Promotion for new Customer (Period-4)**

Promotion for new Customer	
CD Ghazal	Not Selected
CD Oldie	Not Selected
CD new pop	Not Selected
CD Classical	Not Selected
Cassette Ghazal	Not Selected
Cassette Oldie	Not Selected
Cassette new pop	Not Selected
Cassette Classical	Not Selected

**Table A1.27: Promotion for repeat Customer (Period-4)**

Promotion for repeat Customer	
CD Ghazal	Not Selected
CD Oldie	Not Selected
CD new pop	Not Selected
CD Classical	Not Selected
Cassette Ghazal	Not Selected
Cassette Oldie	Not Selected
Cassette new pop	Not Selected
Cassette Classical	Not Selected

**Table A1.28: Select Supplier (Period-4):**

Select Supplier	
Less Lead Time	Not Selected
More Reliable	Selected
Sequentially	Not Selected
Chose Yourself	Not Selected

**Table A1.29: Sales Report (Period-4)**

Product	Sub Product	Variety No	Demand	Sales
CD	Ghazal	1	36	36
CD	Ghazal	2	36	36
CD	Ghazal	3	0	0
CD	Ghazal	4	0	0
CD	Ghazal	5	0	0
CD	Oldie	1	28	28
CD	Oldie	2	28	28

CD	Oldie	3	31	31
CD	Oldie	4	17	17
CD	Oldie	5	1	1
CD	NewPop	1	62	62
CD	NewPop	2	96	96
CD	NewPop	3	93	93
CD	NewPop	4	52	52
CD	NewPop	5	7	7
CD	Classical	1	4	4
CD	Classical	2	0	0
CD	Classical	3	0	0
CD	Classical	4	0	0
CD	Classical	5	0	0
Cassette	Ghazal	1	817	406
Cassette	Ghazal	2	762	418
Cassette	Ghazal	3	0	0
Cassette	Ghazal	4	0	0
Cassette	Ghazal	5	0	0
Cassette	Oldie	1	405	286
Cassette	Oldie	2	643	472
Cassette	Oldie	3	558	403
Cassette	Oldie	4	303	214
Cassette	Oldie	5	81	63
Cassette	NewPop	1	1747	1016
Cassette	NewPop	2	2774	1002
Cassette	NewPop	3	2497	1007
Cassette	NewPop	4	1284	902
Cassette	NewPop	5	301	210
Cassette	Classical	1	73	54
Cassette	Classical	2	59	42
Cassette	Classical	3	0	0
Cassette	Classical	4	0	0
Cassette	Classical	5	0	0

Table A1.30: Inventory Status (Period-4)

Wh No	Product	Sub Product	variety	inventory
1	CD	Ghazal	1	40
1	CD	Ghazal	2	40
1	CD	Ghazal	3	0
1	CD	Ghazal	4	0
1	CD	Ghazal	5	0
1	CD	Oldie	1	262
1	CD	Oldie	2	261
1	CD	Oldie	3	241
1	CD	Oldie	4	271
1	CD	Oldie	5	295
1	CD	NewPop	1	166
1	CD	NewPop	2	108
1	CD	NewPop	3	142
1	CD	NewPop	4	197
1	CD	NewPop	5	277

1	CD	Classical	1	95
1	CD	Classical	2	98
1	CD	Classical	3	0
1	CD	Classical	4	0
1	CD	Classical	5	0
1	Cassette	Ghazal	1	0
1	Cassette	Ghazal	2	0
1	Cassette	Ghazal	3	0
1	Cassette	Ghazal	4	0
1	Cassette	Ghazal	5	0
1	Cassette	Oldie	1	44
1	Cassette	Oldie	2	230
1	Cassette	Oldie	3	261
1	Cassette	Oldie	4	134
1	Cassette	Oldie	5	418
1	Cassette	NewPop	1	0
1	Cassette	NewPop	2	0
1	Cassette	NewPop	3	0
1	Cassette	NewPop	4	0
1	Cassette	NewPop	5	168
1	Cassette	Classical	1	234
1	Cassette	Classical	2	224
1	Cassette	Classical	3	0
1	Cassette	Classical	4	0
1	Cassette	Classical	5	0
2	CD	Ghazal	1	49
2	CD	Ghazal	2	43
2	CD	Ghazal	3	0
2	CD	Ghazal	4	0
2	CD	Ghazal	5	0
2	CD	Oldie	1	273
2	CD	Oldie	2	254
2	CD	Oldie	3	262
2	CD	Oldie	4	272
2	CD	Oldie	5	293
2	CD	NewPop	1	199
2	CD	NewPop	2	119
2	CD	NewPop	3	175
2	CD	NewPop	4	211
2	CD	NewPop	5	284
2	CD	Classical	1	96
2	CD	Classical	2	92
2	CD	Classical	3	0
2	CD	Classical	4	0
2	CD	Classical	5	0
2	Cassette	Ghazal	1	0
2	Cassette	Ghazal	2	0
2	Cassette	Ghazal	3	0
2	Cassette	Ghazal	4	0
2	Cassette	Ghazal	5	0
2	Cassette	Oldie	1	178
2	Cassette	Oldie	2	0



2	Cassette	Oldie	3	56
2	Cassette	Oldie	4	273
2	Cassette	Oldie	5	431
2	Cassette	NewPop	1	0
2	Cassette	NewPop	2	0
2	Cassette	NewPop	3	0
2	Cassette	NewPop	4	52
2	Cassette	NewPop	5	234
2	Cassette	Classical	1	246
2	Cassette	Classical	2	255
2	Cassette	Classical	3	0
2	Cassette	Classical	4	0
2	Cassette	Classical	5	0

**Table A1.31: Other Results (Period-4)**

Result	Data
NUMBER OF HITS ON THE SITE PER WEEK	7466
NUMBER OF NEW CUSTOMERS IN CURRENT PERIOD	4013
NUMBER OF REPEAT CUSTOMERS IN CURRENT PERIOD	1463
NUMBER OF ORDERS COMPLETELY FULFILLED	3012
NUMBER OF ORDERS PARTIALLY FULFILLED	460
NUMBER OF ORDERS CANCELLED	2252
REVENUES IN CURRENT PERIOD	628404.2
AMOUNT PAID TO SUPPLERS	0
AMOUNT PAYABLE TO SUPPLIERS	210328.8
AMOUNT PAID TO COURIER	26361
AMOUNT PAYABLE TO COURIER	0
OVERHEAD, INTEREST, SALARY AND MAINTAINENCE COST PAID	305000
OVERHEAD, INTEREST, SALARY, AND MAINTAINENCE COST PAYABLE	0
CASH IN HAND	436493.1
AMOUNT RECEIVABLE	305225.7
LOST SALES IN CURRENT PERIOD	406588
NO OF DEFAULTERS	68
TOTAL DEFAULT AMOUNTS	17264
FILL RATE	0.483229

**Table A1.32: Promotion for new Customer (Period-5)**

Promotion for new Customer	
CD Ghajal	Not Selected
CD Oldie	Not Selected
CD new pop	Not Selected
CD Classical	Not Selected
Cassette Ghajal	Not Selected
Cassette Oldie	Not Selected
Cassette new pop	Not Selected
Cassette Classical	Not Selected

**Table A1.33: Promotion for repeat Customer (Period-5)**

Promotion for repeat Customer	
CD Ghazal	Not Selected
CD Oldie	Not Selected
CD new pop	Not Selected
CD Classical	Not Selected
Cassette Ghazal	Not Selected
Cassette Oldie	Not Selected
Cassette new pop	Not Selected
Cassette Classical	Not Selected

**Table A1.34: Select Supplier (Period-5):**

Select Supplier	
Less Lead Time	Selected
More Reliable	Not Selected
Sequentially	Not Selected
Chose Yourself	Not Selected

**Table A1.35: Sales Report (Period-5)**

Product	Sub Product	Variety No	Demand	Sales
CD	Ghazal	1	94	86
CD	Ghazal	2	97	83
CD	Ghazal	3	0	0
CD	Ghazal	4	0	0
CD	Ghazal	5	0	0
CD	Oldie	1	8	8
CD	Oldie	2	32	31
CD	Oldie	3	28	28
CD	Oldie	4	14	13
CD	Oldie	5	4	4
CD	NewPop	1	78	72
CD	NewPop	2	149	144
CD	NewPop	3	109	105
CD	NewPop	4	50	46
CD	NewPop	5	12	10
CD	Classical	1	2	2
CD	Classical	2	3	3
CD	Classical	3	0	0
CD	Classical	4	0	0
CD	Classical	5	0	0
Cassette	Ghazal	1	1043	401
Cassette	Ghazal	2	1051	401
Cassette	Ghazal	3	0	0
Cassette	Ghazal	4	0	0
Cassette	Ghazal	5	0	0
Cassette	Oldie	1	400	281

Cassette	Oldie	2	647	429
Cassette	Oldie	3	589	403
Cassette	Oldie	4	295	192
Cassette	Oldie	5	74	59
Cassette	NewPop	1	1800	1017
Cassette	NewPop	2	2927	1000
Cassette	NewPop	3	2587	1005
Cassette	NewPop	4	1364	917
Cassette	NewPop	5	326	223
Cassette	Classical	1	64	43
Cassette	Classical	2	62	41
Cassette	Classical	3	0	0
Cassette	Classical	4	0	0
Cassette	Classical	5	0	0

Table A1.36. Inventory Status (Period-5)

Wh No	Product	Sub Product	variety	inventory
1	CD	Ghazal	1	0
1	CD	Ghazal	2	0
1	CD	Ghazal	3	0
1	CD	Ghazal	4	0
1	CD	Ghazal	5	0
1	CD	Oldie	1	258
1	CD	Oldie	2	244
1	CD	Oldie	3	235
1	CD	Oldie	4	264
1	CD	Oldie	5	294
1	CD	NewPop	1	130
1	CD	NewPop	2	35
1	CD	NewPop	3	85
1	CD	NewPop	4	162
1	CD	NewPop	5	271
1	CD	Classical	1	94
1	CD	Classical	2	95
1	CD	Classical	3	0
1	CD	Classical	4	0
1	CD	Classical	5	0
1	Cassette	Ghazal	1	0
1	Cassette	Ghazal	2	0
1	Cassette	Ghazal	3	0
1	Cassette	Ghazal	4	0
1	Cassette	Ghazal	5	0
1	Cassette	Oldie	1	319
1	Cassette	Oldie	2	0
1	Cassette	Oldie	3	50
1	Cassette	Oldie	4	27
1	Cassette	Oldie	5	382
1	Cassette	NewPop	1	0
1	Cassette	NewPop	2	0
1	Cassette	NewPop	3	0
1	Cassette	NewPop	4	0

1	Cassette	NewPop	5	23
1	Cassette	Classical	1	206
1	Cassette	Classical	2	194
1	Cassette	Classical	3	0
1	Cassette	Classical	4	0
1	Cassette	Classical	5	0
2	CD	Ghazal	1	1
2	CD	Ghazal	2	0
2	CD	Ghazal	3	0
2	CD	Ghazal	4	0
2	CD	Ghazal	5	0
2	CD	Oldie	1	269
2	CD	Oldie	2	239
2	CD	Oldie	3	240
2	CD	Oldie	4	265
2	CD	Oldie	5	290
2	CD	NewPop	1	157
2	CD	NewPop	2	43
2	CD	NewPop	3	123
2	CD	NewPop	4	196
2	CD	NewPop	5	278
2	CD	Classical	1	95
2	CD	Classical	2	92
2	CD	Classical	3	0
2	CD	Classical	4	0
2	CD	Classical	5	0
2	Cassette	Ghazal	1	0
2	Cassette	Ghazal	2	0
2	Cassette	Ghazal	3	0
2	Cassette	Ghazal	4	0
2	Cassette	Ghazal	5	0
2	Cassette	Oldie	1	69
2	Cassette	Oldie	2	270
2	Cassette	Oldie	3	287
2	Cassette	Oldie	4	176
2	Cassette	Oldie	5	411
2	Cassette	NewPop	1	0
2	Cassette	NewPop	2	0
2	Cassette	NewPop	3	0
2	Cassette	NewPop	4	25
2	Cassette	NewPop	5	141
2	Cassette	Classical	1	227
2	Cassette	Classical	2	242
2	Cassette	Classical	3	0
2	Cassette	Classical	4	0
2	Cassette	Classical	5	0

**Table A1.37: Other Results (Period-5)**

Result	Data
NUMBER OF HITS ON THE SITE PER WEEK	11199
NUMBER OF NEW CUSTOMERS IN CURRENT PERIOD	4068
NUMBER OF REPEAT CUSTOMERS IN CURRENT PERIOD	2283
NUMBER OF ORDERS COMPLETELY FULFILLED	3368
NUMBER OF ORDERS PARTIALLY FULFILLED	406
NUMBER OF ORDERS CANCELLED	2458
REVENUES IN CURRENT PERIOD	660101 2
AMOUNT PAID TO SUPPLERS	210328.8
AMOUNT PAYABLE TO SUPPLIERS	204520 8
AMOUNT PAID TO COURIER	26620
AMOUNT PAYABLE TO COURIER	0
OVERHEAD, INTEREST, SALARY,AND MAINTAINENCE COST PAID	0
OVERHEAD, INTEREST, SALARY,AND MAINTAINENCE COST PAYABLE	0
CASH IN HAND	748493 8
AMOUNT RECEIVABLE	342177 4
LOST SALES IN CURRENT PERIOD	410548 8
NO OF DEFAULTERS	77
TOTAL DEFAULT AMOUNTS	12190 5
FILL RATE	0 490429

**Table A1.38: Promotion for new Customer (Period-6)**

Promotion for new Customer	
CD Ghajal	Not Selected
CD Oldie	Not Selected
CD new pop	Not Selected
CD Classical	Not Selected
Cassette Ghajal	Not Selected
Cassette Oldie	Not Selected
Cassette new pop	Not Selected
Cassette Classical	Not Selected

**Table A1.39: Promotion for repeat Customer (Period-6)**

Promotion for repeat Customer	
CD Ghajal	Not Selected
CD Oldie	Not Selected
CD new pop	Not Selected
CD Classical	Not Selected
Cassette Ghajal	Not Selected
Cassette Oldie	Not Selected
Cassette new pop	Not Selected
Cassette Classical	Not Selected

**Table A1.40: Select Supplier (Period-6):**

Select Supplier	
Less Lead Time	Selected
More Reliable	Not Selected
Sequentially	Not Selected
Chose Yourself	Not Selected

**Table A1.41: Quarterly Results (Period-6):**

TOTAL FIXED COST	0
CASH IN HAND	831234
AMOUNT RECEIVABLE	414135
INVENTORY IN HAND (AT COS1)	1162255
LOAN TAKEN TILL DATE	2000000
TOTAL AMOUNT PAID TO SUPPLERS	2131080
AMOUNT PAYABLE TO SUPPLIERS	517898
TOTAL AMOUNT PAID TO COURIER	99823
AMOUNT PAYABLE TO COURIER	0
TOTAL SALES (REVENUES)IN RS	2444091
OTHER REVENUES	0
TOTAL LOST SALES	1567886
TOTAL SALES IN UNITS	25673
TOTAL INTEREST PAID	40000
TOTAL MAINTAINNECE COST PAID	255000
TOTAL ADVERTISING EXPENSES	600000
TOTAL PROMOTION EXPENSES	11843
TOTAL NO OF DEFAULTERS	242
TOTAL DEFAULT AMOUNTS	56424
DEPRECIATION	0
PROFIT/LOSS (+/-) BEFORE TAX	-1256136
TAX RATE	35
TAX PAID	0
PROFIT/LOSS (+/-) AFTER TAX	-1256136
GROSS MARGIN PER UNIT	-48.467
TOTAL NUMBER OF HITS ON THE SITE	98479
TOTAL NUMBER OF NEW CUSTOMERS	16106
TOTAL NUMBER OF REPEAT CUSTOMERS	4681
TOTAL NUMBER OF ORDERS COMPLETELY FULFILLED	10706
TOTAL NUMBER OF ORDERS PARTIALLY FULFILLED	1450
TOTAL NUMBER OF ORDERS CANCELLED	8525
FILL RATE	0.441942
INVENTORY TURN OVER RATIO	3.134247
AWARENESS INDEX	0.040677
SITE ADOPTION RATE	0.263636
CONVERSION RATE	0.236429
CUSTOMER SERVICE INDEX	0.576724
CD PRICING INDEX	0.213079
CASSETTE PRICING INDEX	0.32574
DELIVERY PRICING INDEX	0.5

SITE DESIGN INDEX	0.545455
PRODUCT RANGE INDEX	0.7
Note: All Financial Entries in Rupee	

## Purchase Probability Calculation

### (1) Calculation of $\alpha_T$ , $\beta_T$ , $\alpha_R$ , $\beta_R$

As described in Chapter 4,  $\alpha_T$ ,  $\beta_T$  are linear function of promotion for new customers, product varieties and delivery policy. Here,  $\alpha_T < \beta_T$  and  $\alpha_R < \beta_R$  for given Beta distribution to be negatively skewed.

Statistically, we have found following relationship between  $\alpha$  &  $\beta$

$$\alpha = \bar{x} \left[ \left[ \frac{\bar{x}(1-\bar{x})}{s^2} \right] - 1 \right]$$

$$\beta = (1-\bar{x}) \left[ \left[ \frac{\bar{x}(1-\bar{x})}{s^2} \right] - 1 \right]$$

Where  $\bar{x}$  is stand for sample mean and  $s^2$  is sample variance

(Source: [www.resacorp.com/beta\\_parameterestimation.htm](http://www.resacorp.com/beta_parameterestimation.htm))

As we have no other relationship for  $\alpha$  &  $\beta$ , we have used above mentioned relationship.

We have found that  $\bar{x}$  should be less than 0.499, to get  $\alpha < \beta$ . For simplicity of we

have assumed  $s^2$  is equal to 0.05

We made following function to calculate  $\bar{x}$

$\bar{x} = [\text{Weightage for promotion} * \text{promotion factor} + \text{Weightage for product range} * \text{product range factor} + \text{Weightage for delivery policy} * \text{Delivery policy factor} + \text{Weightage for Customer Service level} * \text{Customer Service level factor (For repeat customers only)}] * 0.499$ ,

All weightage will be set by Instructor. Factors are calculated on basis of player's decisions.

Example

Factor for product Range =

No of Varieties selected by a Player / Maximum varieties a player can select

Similarly others factors are calculated.

## (2) Calculation of $\delta$ & $\gamma$

As described in chapter 4,  $\delta$  &  $\gamma$  are used find out repeat customers purchase probability

Repeat customer probability is mainly depends on customer service level We have assumed  $\delta$  value same for all player and is equal to value of CDNOW (-0.291). For  $\gamma$ , we have made CDNOW's values (0.122) as threshold value

$\gamma$  = Customer Service level factor \* 0.122,

This signifies, if customer service level factor is unit, and then only player can get  $\gamma$  value same as of CDNOW's.

(CDNOW's performance

100% on-time delivery for Christmas (Bizmetric, January 2001)

Ranked #1 in Order Confirmation time CDNOW's Order Confirmation time was less than 1 minute (Bizmetric, January 2001)

Ranked #4 for Order to Receipt -- total order fulfillment (Bizmetric, January 2001)

Ranked in the Top 10 for fastest e-tailers at fulfilling orders for the 2000 holidays (Bizmetric, January 2001)

We have used simple formula to find Customer service level factor

Customer service level factor =  $(T - 0.3*D - 0.5*P - 1*C) / T$ ;

T = total no of orders received

D = No of orders delayed

P = No of orders partially fulfilled

C= No of orders cancelled

Here, we have used different multiplications factors depend on type of order, that can easily understandable

Probability Calculation



Alpha_T	6 901	LL	112923 9
beta_T	7 185	gamma	0 122
Alpha_R	5 024	delta	-0 291
beta_R	5 595		

Table A1.42. Actual Sales of CDNOW

Units	Week											
Purchased	1	2	3	4	5	6	7	8	9	10	11	12
0		1478	3033	4763	6608	8616	10829	12716	14698	16774	18881	20902
1	750	852	984	1066	1237	1262	1204	1278	1397	1444	1387	1148
2	383	387	456	484	566	649	592	606	644	659	677	663
3	191	214	270	267	293	320	302	343	365	374	355	367
4	95	120	114	161	163	196	156	195	179	187	199	182
5	55	72	68	89	96	96	80	100	95	118	94	120
6	36	40	42	40	51	54	65	45	75	71	72	54
7	18	12	27	30	36	40	39	31	41	37	30	43
8	12	15	9	21	19	21	20	24	23	29	24	32
9	9	9	8	9	21	14	21	8	14	9	12	16
10+	25	17	27	32	36	55	39	35	48	42	50	43
Incr triers	1574	1642	1822	1924	2164	2197	2024	2034	2198	2165	2037	1789
Cum triers	1574	3216	5038	6962	9126	11323	13347	15381	17579	19744	21781	23570

Table A1.43 Forecast Probabilities

[illegible]

Table A1 44 Weekly Repeat Buyer Probabilities

Weekly P(possible repeat buyer)	0.1215	0.0993	0.0882	0.0760	0.0721	0.0689	0.0663	0.0641	0.0621	0.0604
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Distribution of repeat purchase volume (given possible repeat buyer)

Units		Units	
0	0.4731	7	0.0101
1	0.2278	8	0.0068
2	0.1191	9	0.0047
3	10+	10	0.0137
4	0.0390		
5	0.0240		
6	0.0153		

Units											
Purchased	1	2	3	4	5	7	8	9	10	11	12
0	0	1473	3029	4762	6600	10776	12727	14689	16807	18899	20872
1	771	848	974	1062	1217	1228	1264	1376	1394	1363	1269
2	367	406	467	511	587	596	615	669	680	666	623
3	187	208	240	263	303	309	320	348	354	348	327
4	100	112	130	143	165	170	176	192	195	193	182
5	57	64	74	82	94	98	101	110	113	112	106
6	33	38	44	49	56	59	61	66	68	67	64
7	20	23	27	30	35	36	38	41	42	42	40
8	13	14	17	19	22	23	24	27	27	27	26
9	8	9	11	12	14	15	16	17	18	18	17
10+	18	21	25	29	34	37	39	43	45	45	44